PREMIERE ISSUE!

MAXIMUM PC PRESENTS

MAXIMUM Linux

news reviews & how tos

REVIEWED:
- Caldera OpenLinux 2.2
- SuSE Linux 6.1
- Red Hat 6.0
- Deluxe Linux OS 6.0
- GIMP
- VMWare

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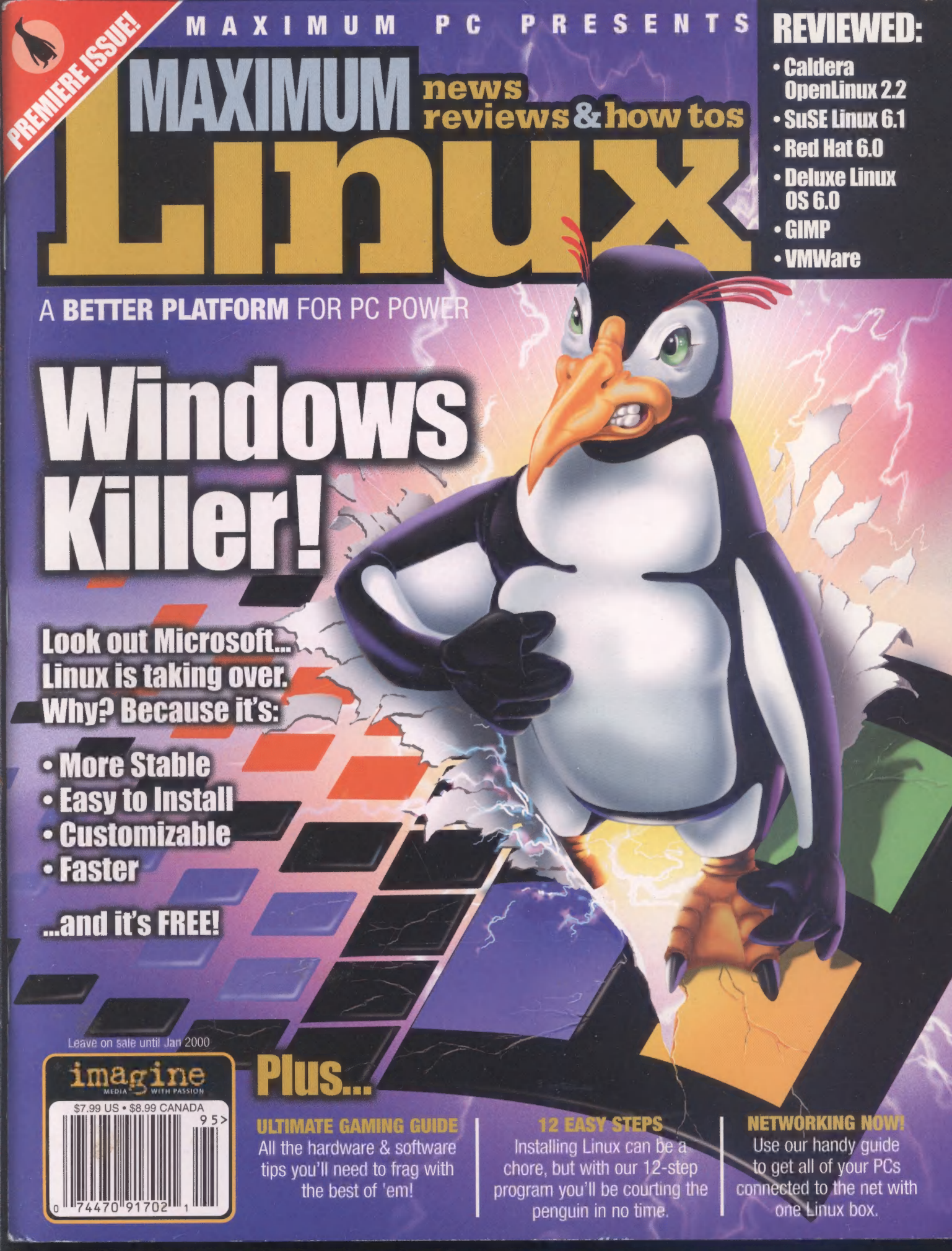

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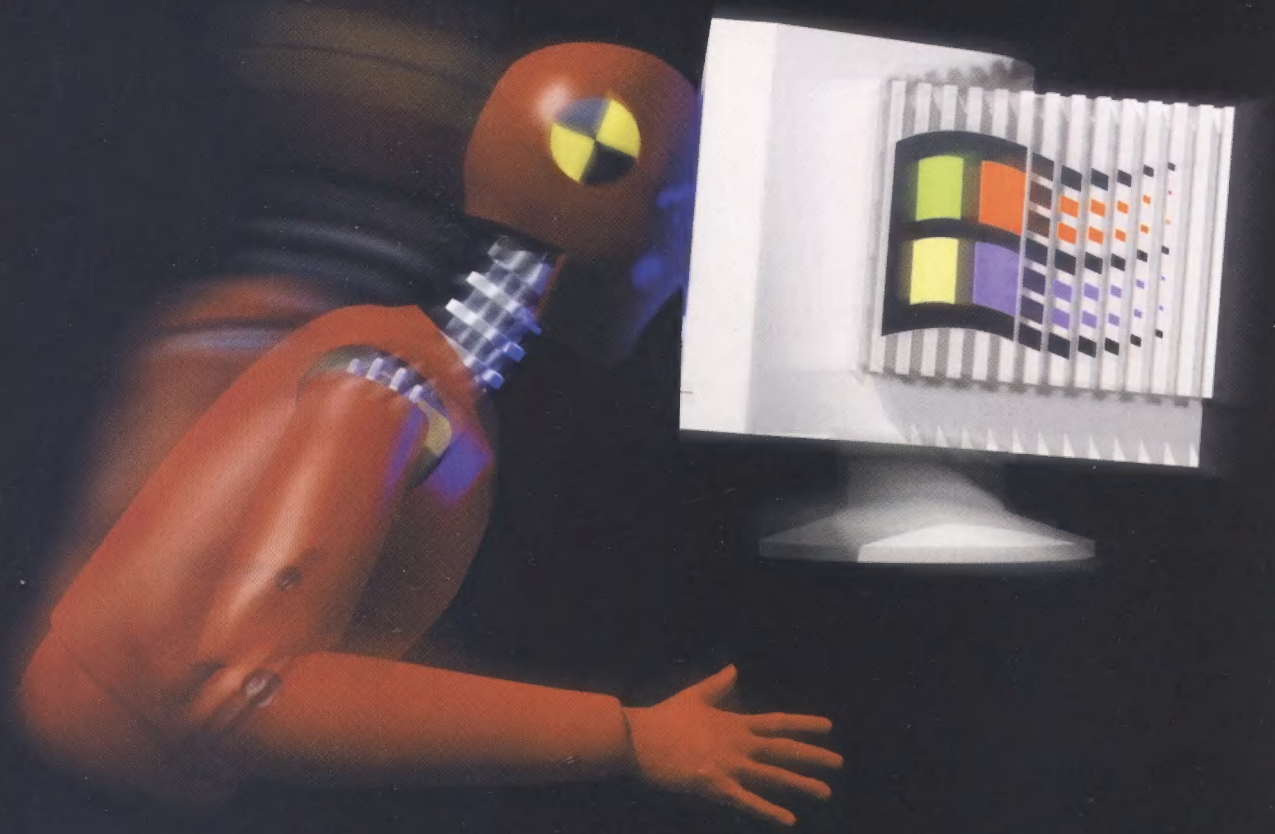

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"I DIDN'T KNOW WHAT LINUX WAS, AND I DIDN'T PARTICULARLY CARE. ALL I KNEW WAS I WANTED TO RUN IT INSTEAD OF RUNNING WINDOWS JUST BECAUSE IT LOOKED BETTER."
—Linux.com's Trae McCombs

MAXIMUM CONTENT
OCTOBER 1999

depts

7 Maximum Editor
Our trusty Editor-In-Chief comments on the phenomenon that is officially known as Linux, explains exactly what this magazine is all about, and provides a sneak peek into the type of content that's planned for the future.

9 Disc Page
The Maximum Linux CD is your indispensable source for all the applications, utilities, drivers, and demos needed to make your box rock. But this month, we keep things simple: a full install of LinuxMandrake 6.0. Rock on!

10 Letters
This month's crop of reader letters includes a plea for more content, tears of joy, and a dead guy. Our mail doesn't get much more interesting than this.

17 News
Taken hot off the proverbial presses, these are the month's hottest headlines, product announcements, and upcoming Linux events. This month: the fight between Linux and NT, and why Mindcraft's testing methodology has Linux users spitting mad.

19 Ask The Penguin
Got a problem with your Linux box? Never fear, the Penguin's here, and he's ready to answer all of your most pressing Linux-related questions. From networking to kernel hacks, this is your one-stop shop for tech talk.

32 12-Step
Because we're nice enough to include a full Linux distribution on the Maximum Linux CD this month, we thought it'd be cool to include a comprehensive step-by-step guide on how to install it. Now you have no excuse not to install Linux.

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12 Linux Primer

Looking for the 411 on the OS that's the talk of the town? Here's our low-down, from top to tails, on the whole Linux phenomenon. We tell the story of how Linux came to be, and explain the differences between all the available distributions. We even get to the bottom of this whole penguin thing.

20 Interview: Trae McCombs

Trae McCombs is the site manager for Linux.com and says Linux is a means to world liberation. Why? Because it works, you silly goose. And unlike some, uh, other OSes you may be using, Linux doesn't cost anything to use.

25 Penguin Got Game

You don't have to run Windows to play games on your Linux box. Gaming guru Mike Luton steps you through the process of choosing the right hardware for the right software, and dishes out tips and tricks for fan faves such as *Kingpin* and *Quake III Arena*.

MAXIMUM

CONTENT

OCTOBER 1999

"THERE'S SO MUCH HYPE AROUND LINUX THAT YOU HAVE TO ASK YOURSELF, 'DOES IT ACTUALLY LIVE UP TO WHAT IT SAYS?' THE ANSWER, WE PROVED, IS NO."
—Mindcraft owner Bruce Weiner

37 Networking Nice Guy

Anders Brownworth, our amicable technical editor who spends way too much time online, takes an overdue time-out to explain how to get your Linux box—and all those other computers on your home network—onto the World Wide Web.

41 Kernel Rebuild

Recompiling your kernel isn't brain surgery, but you'll experience faster bootups and snappier responses at the command line and in native applications. So scrub up, Doc—using all of our tips and tricks, we're gonna perform some maneuvers that'll breathe new life into your current distribution.

46 Distribution Dilemma

Linux is a legitimate operating system that rivals the established giants of the Unix universe. You know you want a piece of the action, but there's one problem: Which distribution is the best? Read our comprehensive review roundup for all the nitty gritty details.

depts

57 Pure Lust
Tech toys guaranteed to make you drool. This month's compilation includes three killer Linux boxes, all fast enough to break the speed of sound (and your bank account).

60 LRC
Every month we compile a list of web links we think you'll find useful on your Linux adventures. Tear it out, frame it, and keep it next to your PC. You'll find it handier than a wet nap at a KFC buffet.

61 Terminator
You know all those blue, underlined words in Maximum Linux? Hyperlink to this page to figure out what the heck they all mean.

64 Alt.OS
Dedicated to true tales from the Linux front line. This month, Mae Ling Mak recounts her personal tragedies with Windows, and relives that momentous day when she finally became a Linux convert. Testify!

reviews

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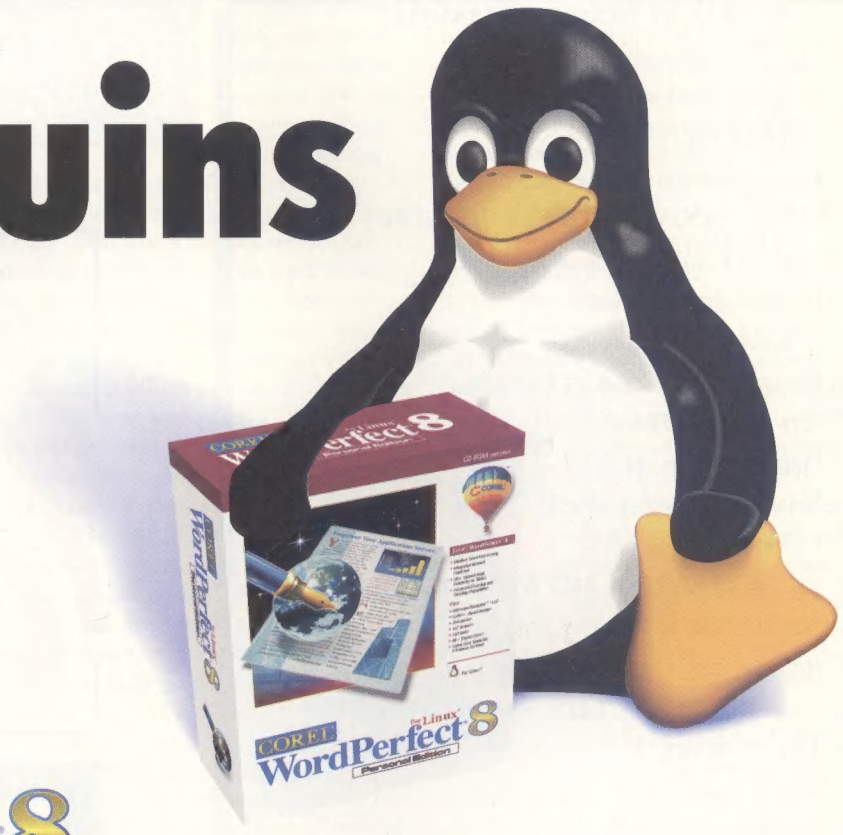
Plays Well with Penguins



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Linux

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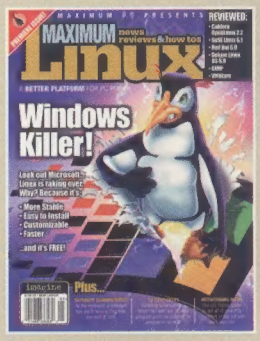
Welcome to a Brave New World

Welcome to *Maximum Linux*, the first official spinoff magazine from *Maximum PC*.

If you're wondering why we're devoting an entire magazine to an OS that some still call "niche," consider this: Linux is more stable than Windows, less susceptible to the dreaded "blue screen of death," and faster for both server-class and home-use environments. And, in case you hadn't noticed, our cover reflects the fact that Linux busted out this year, establishing itself as a serious threat to Windows' dominance in the OS marketplace.



Thanks to its heritage as a free and open OS, the Linux phenomenon is growing at a frenetic pace. Companies such as IBM, Dell, Intel, Oracle, and Compaq have all pledged allegiance to the penguin flag. Red Hat went public and saw its stock triple in first-day trading. Corel just announced Corel Linux, a new distribution targeted at winning over Windows 95 and 98 users. Loki Entertainment continues to make noise with its ports of popular PC games, such as *Civilization: Call to Power* and *Myth II: Soulblighter*. id Software deity John Carmack is busy finishing up the release of his eagerly anticipated frag fest, *Quake III Arena*, which will be released simultaneously for Linux, Windows, and Macintosh sometime this fall. And thanks to the non-profit group Linux Fund, you can now get yourself a Linux credit card—adorned with a devilishly cute penguin, of course—the proceeds of which will provide financial support for open source developers.

In other words, Linux is ready for primetime.

And yet, beyond the fact that many major players in the Linux community now have commercial aspirations, Linux hasn't strayed far from creator Linus Torvalds' original vision of a free and incorruptible OS. His ambitious "no ownership" philosophy guarantees that no one entity will ever control, change, or prosper from Linux by excluding others from the inner sanctum.

In essence, Linux is about more than just an OS. It's about a community that has banded together to further a cause they all believe in, a group of dedicated professionals and eclectic characters who look out for one another, not because they're getting paid to modify, update, or alter the code, but because they want to work together in worldwide harmony.

We're taking a cue from the open-source community, a group whose sole mission in life is to promote the creation of software that can be freely modified and distributed. Along with the crack team of editors and artists assembled under the *Maximum Linux* roof, we're putting the call out to you: We need you to help us shape and define the contents of this magazine. With your help, we can fulfill our mission to deliver an unbridled Linux experience that everyone can truly appreciate.

We're all excited about the possibilities for Linux, as we are about the possibilities for this magazine. We want to produce something that you'll not only enjoy reading, but also look to as a resource and information tool. This very first issue—which contains everything from a Linux primer to a highly technical networking how-to—was built on that premise. Our subsequent issues will contain content just as technically diverse; we'll nurture those new to Linux, and provide technical expertise to those already in the know.

This time next year? We doubt you'll ever hear the words "Linux" and "niche" in the same sentence.

—Bryan Del Rizzo, Editor in Chief

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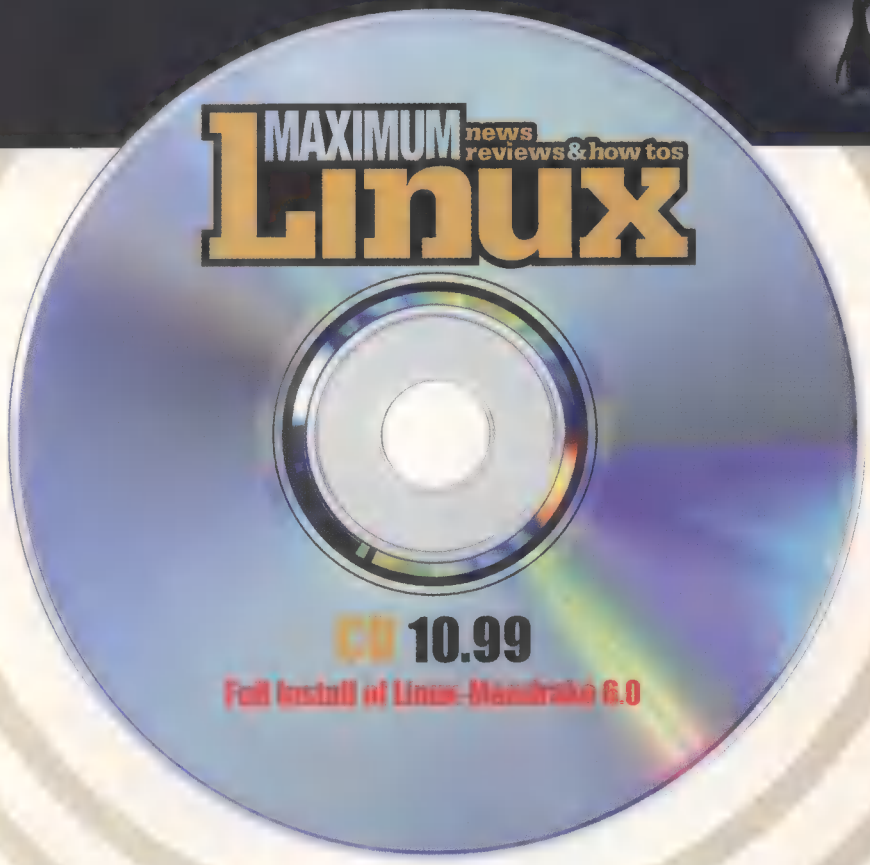

MAXIMUM DISC

THIS MONTH:

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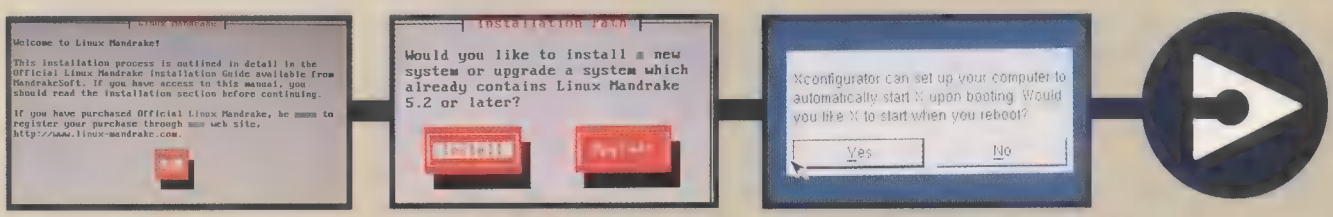
See our 12-Step How-To on page 32 for complete instructions on how to install Linux-Mandrake 6.0 from the enclosed CD-ROM.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Yes
No

MAXIMUM LETTERS

If you're wondering why there are reader letters in the very first issue, there's a simple explanation: We made them up! No, no, we didn't make them up. We put a call out to Linux-related newsgroups and chat rooms before putting this issue to bed. Next time around, we'll fill these pages with the hordes of mail we fully expect to receive from you.

Maximum Linux is dedicated to the legions of Linux fans throughout the world. But we won't know if we're really dishing up the lemony-freshest Linux content unless we hear from you. Agree or disagree with what we're saying? Write us and tell us why; we promise to read every letter that comes across our desks. Reach us at editor@maximumlinuxmag.com.

Lawn Care 101

I think *Maximum Linux* will be a great idea—if the magazine is a hard hitter. In other words, if something you review is crap, are you going to call it crap or fertilizer?

Here are the top 5 reasons I use Linux:

1. Linux runs faster on my notebook and uses less battery power than Win9x.
2. Linux can display remote Unix X-Apps.
3. Linux does virtual desktops.
4. Linux does not crash.
5. Linux does not need constant patches/updates/tweaking/babysitting to keep it running. It just runs!

—Jeff Shaffer

Editor-at-Large Brad Dosland responds: Will *Maximum Linux* be hard hittin'? Well, you're holding the magazine in your hands and you're the ultimate judge on the matter. Our goal with *Maximum Linux* has been to follow the same "Minimum BS" credo that made our parent publication, *Maximum PC*, the success that it is. In fact, the same editorial team has pulled together *Maximum Linux*, so we're sure you'll dig it.

And let me add to your list:

6. Linux users demand the best, whether you're talkin' magazines or OSes.

Please, Sir. Can I Have Some More?

With all the attention Linux has been getting lately, I finally made the effort to install it on my PC. As you are probably aware, support for advanced graphics is spotty, but there are rumors of upcoming improvements. I'd like to know what you've tried and what you've thought of it. Have you tried *Quake* with Linux? What do you see down the road? When I build my next system I'll try to make hardware decisions with Linux in mind (just so those video adapter folks know).

—Richard B. Hegeman

Editor-In-Chief Bryan Del Rizzo responds: Congratulations on taking the plunge! It can be somewhat overwhelming, but the payoff can be well worth it. And you're right—graphics support is still lacking. But like everything else, this will change with time. Hardware companies take notice of trends, and if there are enough Linux users to justify their time and money, they'll do it. In the meantime, you can still use 3dfx or nVidia-based boards, including Voodoo^2 and TNT2. Be sure to check out our in-depth gaming feature on pages 25–30 for more in-depth gaming-related information and how-tos.

> "The more people see that Linux is being embraced by mainstream media, the more people will embrace Linux itself."

Tears Of Joy

I'm really happy, shocked, and overjoyed that a mainstream publishing group is going to publish a Linux magazine. The more people see that Linux is being embraced by mainstream media, the more people will embrace Linux itself. The success of the magazine, and I do believe it will be successful, will only mean that there will be more software ported to the Linux platform, including games and other applications.

But I'm curious... what kind of a balance are you going to have between commercial content and open source software? I realize that commercial content is going to be what drives advertising revenues, but Linux has its roots in the open-source movement and most Linux advocates will want to see both sides of the software spectrum. Plus, new users really need to be informed about everything that is out there for them.

In any case, this is a great step for Linux and its devotees, and I will definitely be a subscriber.

—Gerald Fischer

Managing Editor Kristen Salvatore responds: Aw, shucks. Thanks for the vote of confidence.

As for your question: As the saying goes, you can't be all things to all people—but we'd sure as heck like to try. We think the value in including information on commercial offerings extends beyond our own advertising needs, because people do want to know about what's offered in the general marketplace. And, as you indicated, for new users or those who are still getting their technological feet wet, it's important to know what's out there and where to find it.

On the other hand, this is not the Maximum Linux Catalogue—there's a lot more to be rooted out and written for you than just, "Here's what you can buy and where." Part of Linux's luster is the philosophy that drives it, and the down-and-dirty work that folks are doing with it (and on it, for that matter). Our goal is to ensure coverage with depth as well as breadth, and that means including as much nitty-gritty as we can on Linux form and function, on the open-source movement, and on the software and hardware that folks in the Linux community are using or creating.

RIP

If *Maximum Linux* continues to bundle a CD with new distributions and software, I will die a happy man.

—Matt Fields

Editor-In-Chief Bryan Del Rizzo responds: Alas, poor Matt, we knew you well...

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Linux Primer

A quick introduction to Linux and the open-source movement

Looking for the 411 on the OS that's the talk of the town? Here's our low-down, from top to tails, on the whole Linux thang.

— Rob Hall

• IN THE BEGINNING...

A long time ago—1991, to be exact—a self-described poor computer science student named Linus Torvalds bemoaned the way PC operating systems worked. Windows and DOS didn't provide the stability and reliability he needed, nor did OS/2. Unix was great, but for a college student who could barely scrape together a down payment on a lager at the local pub, Unix was out of reach. Desperate for something better, Torvalds decided to create his own OS. He toiled long and hard, and in 1994, the fruits of his labor were finally born. Torvalds decided to make his creation, dubbed "FREIX" for "Free Unix," available to all, and to eliminate the chance it could be commercialized, he put it on a public FTP site. But when the site administrator didn't like the name, it was changed to "Linux," and it quickly became more coveted than a keg of Heineken at a frat party.

Linus Torvalds, self-proclaimed top programmer in the world, and creator of the Linux operating system.

• SO, WHAT IS IT?

Linux is a 32-bit Posix-compliant operating system that's compatible with Unix source code. It's an open source system, which means the source code—the original ASCII code written by the programmer—is available to all who wish to modify and change it, as long as they release the modified and updated code. Today, thousands of programmers around the world update Linux code daily, and new versions of the kernel are released almost monthly.

• INACCURATE PERCEPTIONS

The most common misconception is that Linux is a Unix clone; this is completely untrue. Linux is like Unix in that Torvalds liked the way Unix felt, and the way it did things. Linux is unlike Unix in that its kernel is modular—it can be recompiled at any time with add-on code called modules. Modules allow users to add support for various hardware and software without adding to the overall size of the kernel. Modules may be loaded and unloaded while the system is running, eliminating the need to reboot when adding support for hardware. Linux also employs some very different commands than those utilized by Unix.

• IF YOU PORT IT, IT WILL RUN

Porting refers to alterations made to the source code of programs or operating systems, allowing them to run on different hardware or software. Linux can be ported to a wide range of platforms, including PC, Alpha, Macintosh, and SPARC—there's even a version for 3Com's line of Palm-branded PDAs. It's easy enough to explain, but the process of porting is quite challenging.

In order to port an operating system to another hardware platform, programmers must know intimate details about the hardware and software. For example, does the processor use little endian or big endian to sort data? What type of bus is supported? What type of memory does the system use?

Once those questions are answered, the operating system or program must be rewritten in a way that supports the hardware's manner of interpreting data, supporting hardware, and reading memory. This process—which can take months of time, lots of headaches, and, depending on the programmer, lots of alcohol—often requires rewriting the entire kernel so it will support the new configurations.

The success of porting software to other operating systems can be mixed, and largely depends on the standards that dictated the program's original composition. For example, if the program was originally written in Posix-compliant source code, only its header files must be modified. If not, many sections of the code may need to be rewritten. Some operating systems, such as Linux and other Unix clones, prefer programs written in C or C++. If the original program was written in another language, such as Pascal or Fortran, then the programmer faces the ugly task of interpreting every line of the code into a C or C++ equivalent.

Typically, games are ported more often than anything else. Some companies—most notably id Software—actually write

For definitions of Terminator words, hyperlink to the back of Maximum Linux.

Many have fallen to the mighty Gates OS regime, but some say Linux offers hope in this time of despair. Could Linux usher in the salvation, security, and stability users are looking for?

their games first in Linux, then port them to the Windows platform; Linux interacts directly with hardware, so programmers needn't jump through software interpretation hoops in order to get things to work in the other platform.

• MAN THE FLAPS! SECURE THE AREA!

Linux is ideal for network and web servers, or "daemons" as they're called in Linux and Unix-type environments. The benefits of Linux's multi-user nature are wide-reaching: You can use the same machine to set up different types of accounts based on a user's needs, whether that user is you or a guest, and users can be granted different levels of access, or permission to access different files.

Linux is also more stable than your local psychiatrist; it manages memory properly, so it doesn't crash very often. The only instance in which Linux as a system will crash is when a drastic change is made to the base file system or the library files. If a program does take a nose dive, it won't take the entire system with it because its process is isolated from the other vital system functions.

Unlike Windows, unfortunately, Linux is a command-line-based operating system, which can be as intimidating as a 300-pound Hell's Angel whose Harley you just scratched. So, for those who prefer a point-and-click interface, configurable graphical user interfaces are available, including the popular X Window System (see page 54).

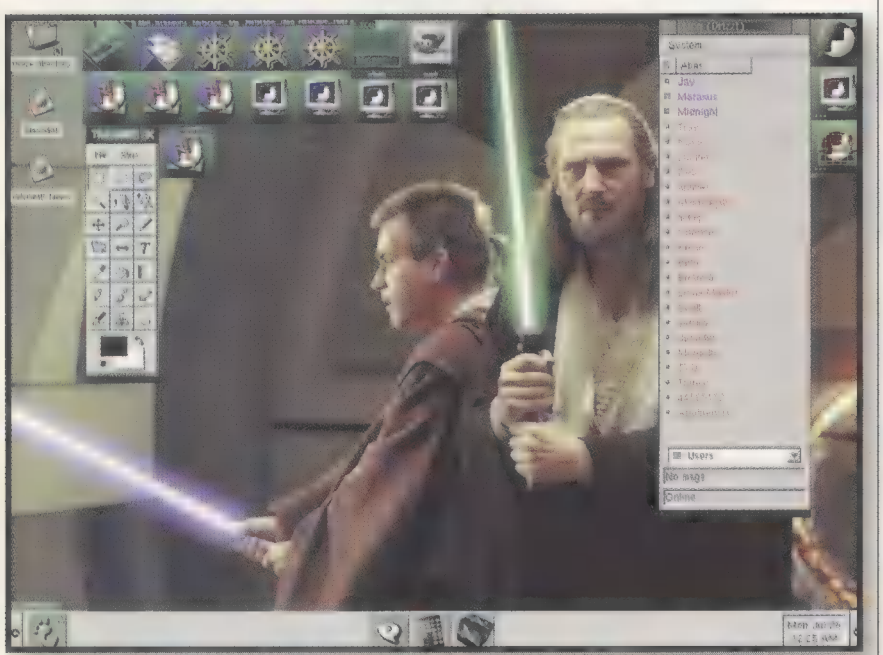
Top 10 cool things you probably didn't know about Linux...

1. **Linux can share its file system with other operating systems.**
2. **When running X Window, you can drop to a console prompt by hitting CTRL+ALT+F#; when you're done, you can switch back to X with CTRL+ALT+F7.**
3. **Linux can support up to 64 tty consoles and 2048 pty consoles**
4. **Linux enables you to use firewall rules on your LAN to forward packets from machines on the network to the Internet, effectively putting your entire network on the Internet.**
5. **You can restrict TCP access to your Linux system without use of a firewall.**
6. **Linux can read/write foreign file systems, including Macintosh and NTFS.**
7. **Linux can support up to 10TB of disk space.**
8. **While using Linux, you can use a program called "ttysnoop" to spy on telnetted users.**
9. **Linux would probably run on your toaster.**
10. **Linux will run on a 386 with 4MB of RAM.**

• IF YOU CAN'T RUN IT, EMULATE IT!

By far the most popular question asked by beginners is: "Can I run Windows-based programs under Linux?" Generally, the answer to that question is no—but like most rules, there are exceptions. Running applications that are foreign to your system generally requires an emulator. Emulators essentially fake your system out by creating a virtual environment in which to run "alien" applications. They're used most often by gamers to run PlayStation or Nintendo games on their PCs, but emulators are also available to run applications built for different operating systems.

A program called *Wine* serves this function on a Linux box, allowing you to run Win32-based applications from within X Window. We've been able to make *Half-Life*, *Solitaire*, and even *Microsoft Word* run, and there are reports of many other applications being run in the same manner. But these setups aren't exactly known for their stability, and are still prone to bugs and crashes.



Brought to you by the letter X—as in X Window running WindowMaker window manager and Gnome as an add-on package. May the open source be with you.

• DISTRIBUTION WARS: THE PHANTOM MENACE

So, at this point you may be thinking, "This sounds good, but I've seen several different 'brands' of Linux." These brands are actually called distributions. If you associate Linux with ice cream, distributions are like flavors. There are dozens of different distributions, the four most popular being Red Hat, Slackware, Debian, and SuSE. Red Hat is known for its ease of installation, but some of its scripts are broken or don't perform the way they should. Slackware is known for its wrestle-a-bear-and-eat-snakemeat approach to installation, but after it's installed properly, everything generally works the way it should. Debian and SuSE are similar to Red Hat in their manner of installing software, and each uses precompiled binaries with install scripts, known as "packages." (For a full review and comparison of these distributions, check out pages 46–52.)

Most distributions aren't compatible with one another, but you can install programs that allow you to use foreign packaging systems, or convert packages into the system used by your distribution. Each

distribution has its own quirks, and the best way to choose one is to simply decide which you prefer. Distributions are updated regularly by those who work with them, and the updates often include more applications, updates, and documentation.

• CUSTOMIZING YOUR KERNEL

The kernel is the heart of the Linux operating system. Stay away from the developmental kernels unless you're an experienced Linux user, as they may not (like the *Maximum Linux* staff) be entirely stable. Each release of the kernel contains more options, support, and bug fixes than the previous versions. It's quite simple to modify aspects of the kernel, but many who see that the source code comes with the package think they can modify the kernel at a more profound level. Don't even think of doing this unless you're a very experienced programmer. If you're not familiar with the C programming language, you may render your system unable to start or your kernel source broken beyond repair. As a rule, leave the kernel modifications to the experts.

Although Linux is a great operating system for hardcore techies, programmers, and geeks, it can seem somewhat unfriendly to the average user. It will most likely take better support, easier interfaces, and additional applications to rocket Linux into mainstream use, but with support blossoming from major PC OEMs such as Compaq and IBM, Linux may not be far from take-off.

• WHY SHOULD BILL GATES GIVE A HOOT?

The Linux movement is picking up steam. Lots of steam. In fact, Linux may just be the NT-killer people have been looking for—it certainly has the cajones to do the deed. Despite Microsoft's FUD (Fear, Uncertainty, and Doubt) campaign, Linux is still gaining momentum in the server market. Microsoft can't out-and-out buy Linux, since no individual or company owns it. That also makes it hard for Bill and his gang to combat it. Plus, Linux has its roots in Unix, which has been in use for more than 30 years because its methods are so tried and true. Linux also boasts a faster file system than NT, making it a better file server. Security holes and program bugs are patched and fixed much faster than those in any Microsoft product, and now many software and hardware vendors are backing Linux as a true competitor to Windows. So, should Bill be afraid? Yes. Very afraid.

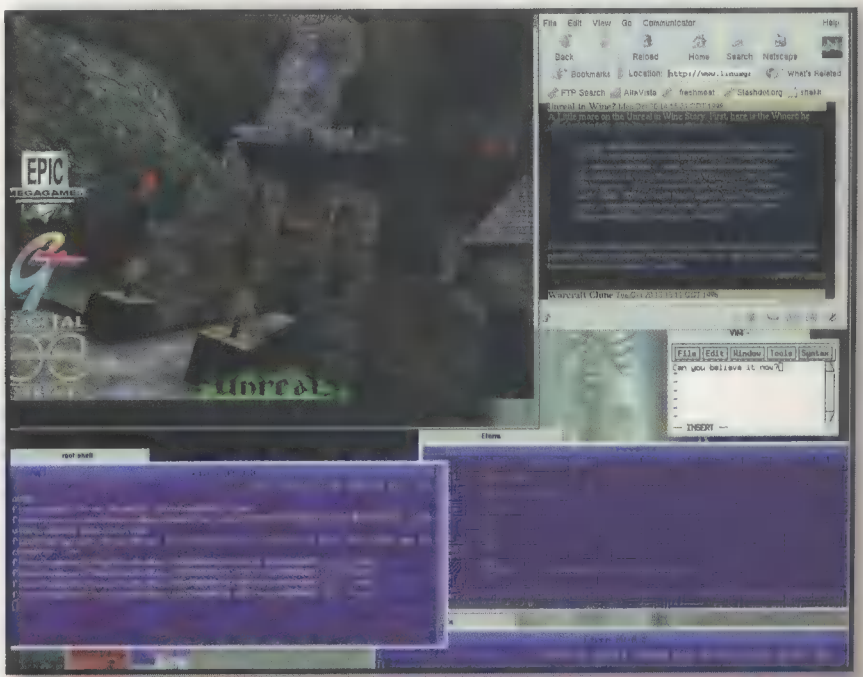
What's up with the penguin?

The use of the penguin logo got its start when Torvalds took a vacation in Australia and found himself on the biting end of a fairy penguin. "One bit me when I attempted to pet it and a few years later, when we were discussing what kind of logo people wanted, I decided on the penguin," Torvalds recounted in an interview that originally appeared in *boot* Magazine. "Some people are still unhappy because they think it's too noncommercial, but it's meant to be more fun than serious. I'm much happier being associated with a fun and slightly irreverent logo than with something static and boring."

Is Linux GNU to you?

The term "open source" is primarily used in reference to the GPL agreement created by the Free Software Foundation. GPL stands for General Public License. GPL is the heart of the open-source movement; it states that the source code of any program released under the GNU General Public License must be readily available to all, and that it may be freely modified and distributed.

Open source is more than just a set of rules to follow. To the programmers creating the software under its auspices, it's a way of life. They make no money off open-source software, and inevitably hold down normal jobs, usually as programmers in other industries. Open source relies on the abilities of many, not just one. This is why programs and operating systems such as Linux are being developed by millions of programmers worldwide, and why programs are updated and fixed so swiftly. If you wish to read the complete GNU General Public License, it's available on the web at **www.linux.org/info/gnu.html**.



They're far from perfect and they can't accurately run every game, but emulation programs for Linux may become a force to be reckoned with.

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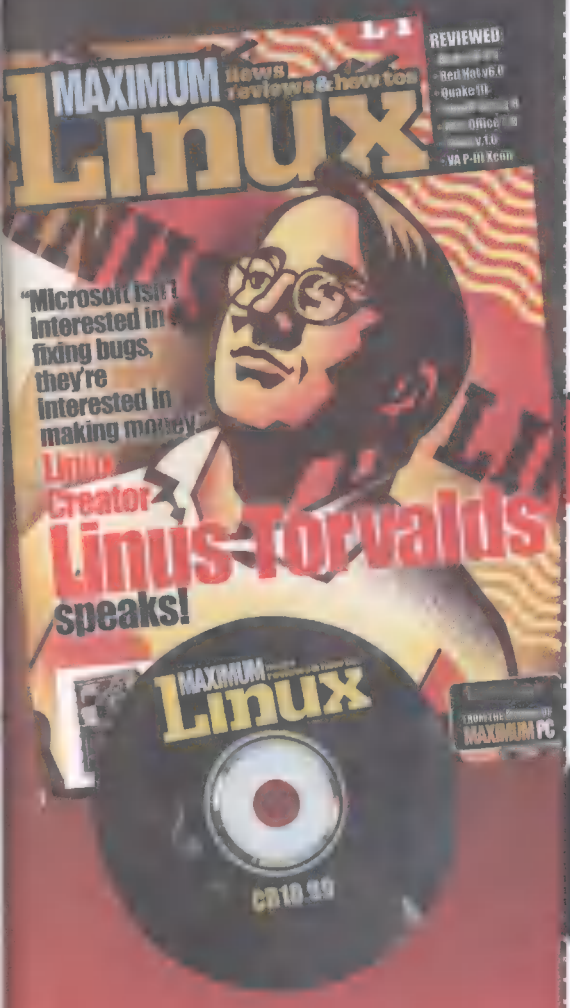

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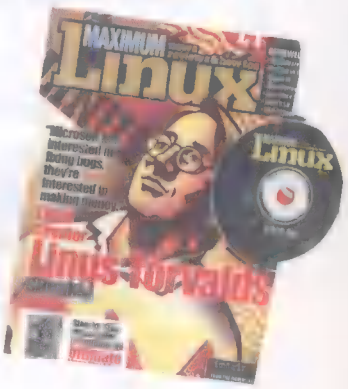

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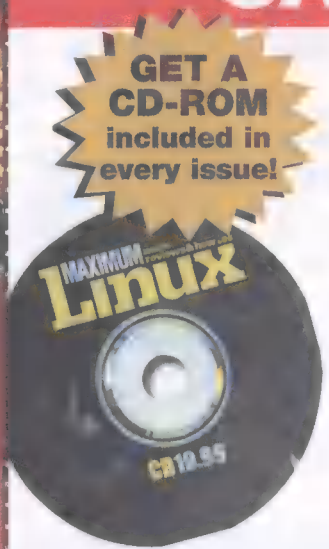

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"THE PROBLEM WITH BENCHMARKS IS THAT THEY TELL A TRUTH, BUT OFTEN NOT THE GENERAL TRUTH."

— ALAN COX

Linux Outsells Windows 98 In Japan

According to figures compiled by Business Computer News, TurboLinux J 4.0 outsold all other operating systems, including Windows 98, during its first week on retail shelves in Japan.

TurboLinux captured 24% of the market, with Windows 98 taking 9% and Macintosh OS 8.5 garnering 10%. The figures reflect only new operating system purchases, not upgrades. When upgrades were factored in, Windows 98 remained the dominant OS.

A spokesman for TurboLinux said, "The numbers clearly highlight TurboLinux's impressive presence and acceptance rates in the Japanese OS market."

Linux 2.4 Coming Soon

In an effort to win some mainstream appeal, Linux will undergo some revamping this fall. Among the more interesting changes proposed is added support for Universal Serial Bus (USB) and IEEE 1394, two industry-accepted connectivity standards that have been widely adopted by many PC peripheral manufacturers.

Other consumer-friendly additions include support for more advanced processors, including AMD's new Athlon; support for up to eight IDE controllers; improved videocard drivers; and support for infrared devices.

Linux version 2.4 is expected to arrive by the end of the year.

Linux Showcase Firms Up Dates

The Linux Showcase, an annual volunteer-run event designed to further the use of Linux in public and private sectors, will be held at the Cobb Galleria Center in Atlanta, GA, on October 12 to 16, 1999.

More than 50 companies, including Penguin, Adaptec, and KDE, will exhibit at the show. As an added bonus, the first 100 technical conference registrations completed over the web will win a complimentary OS Wars t-shirt, featuring several prominent members of the Linux and open-source movement in a parody scene that's sure to be recognized.

To register for the showcase, or for additional information, visit *www.linuxshowcase.com*.

Linux vs. NT: Fight!

Controversial match still sparking debate

It was to have rivaled the Thrilla In Manila. Mindcraft's prizefight pitted welterweight Linux against heavyweight Windows NT 4.0 for the third time. Set on neutral ground in the labs of industry publication *PC Week*, with representatives from Microsoft and Red Hat, and other Linux luminaries looking on, the bout resulted in a controversial victory for Windows NT.

Months after the June match, Linux users are still wondering whether it was a fair fight or a Don King finesse. Outspoken Linux proponent Alan Cox says the fix was in. "The problem with benchmarks is that they tell *a* truth, but often not the general truth," Cox says. "So, for a specific unrealistic case, NT is faster. We can supply other cases where NT is slower." Indeed, test results published in other magazines have heralded Linux as a faster server OS than NT.

Cox's biggest beef lies in the way the test was represented: The benchmarks specifically measured the OSes' web- and file-serving capabilities, but the results are being touted as proof that Linux is slower than NT overall.

Mindcraft owner Bruce Weiner says those still contesting the benchmarks have nothing but sour grapes and his company's name has been vindicated.

"The conclusions were basically what we said in our reports—that NT is faster in enterprise-class systems. There's so much hype around Linux that you have to ask yourself, does it actually live up to what it says? The answer, we proved, is no."

This Linux/NT battle was the third of its kind. The first meeting elicited howls of protest from the Linux community because Microsoft was footing the bill for the event. A second run was staged, but the results of that standoff were never released. The third round was to set the record straight.

Doug Ledford of Red Hat attended the third match and says he, too, has issues with the benchmarks. Though the tests were "industry standard" benchmarks used regularly by *PC Week*, Ledford feels that they measure only a server's ability to dish out static content—and not many people with $20,000 quad-Xeon machines are just pushing down static web pages. Ledford and Cox both feel that a more accurate representation of Linux's might was displayed by German magazine *C't*'s report on the OS's performance as a dynamic web server.

"Keep in mind that in the retest at *PC Week*'s lab, we were not able to reproduce everything the first Mindcraft test showed," Ledford says. That fact alone has raised many eyebrows about Mindcraft's objectivity. Still, Ledford doesn't totally dismiss the Mindcraft benchmark and said the process did unearth some Linux performance bottlenecks.

And that's where the open-source model really flexed its muscles. Within weeks of the bottlenecks being revealed, the Linux development community fixed them and new Linux versions were made available.

Try that with NT.

Corel Linux Unveiled

At last month's LinuxWorld trade show, Corel unveiled Corel Linux, a new version based on the Debian/GNU distribution. According to a press release, the new distro will feature an enhanced graphical user interface and a new installation program that "greatly simplifies the installation process."

Corel Linux will be available as a stand-alone product, but will also be bundled with the company's upcoming *WordPerfect Office for Linux* suite, which should be available in early 2000. Corel Linux's first release date is pegged for late 1999, with a beta version hitting desktops sometime in September.

Pricing has not yet been determined.

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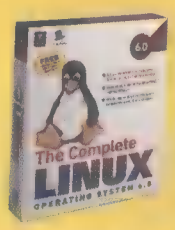

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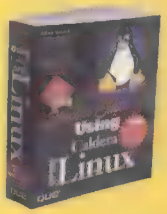

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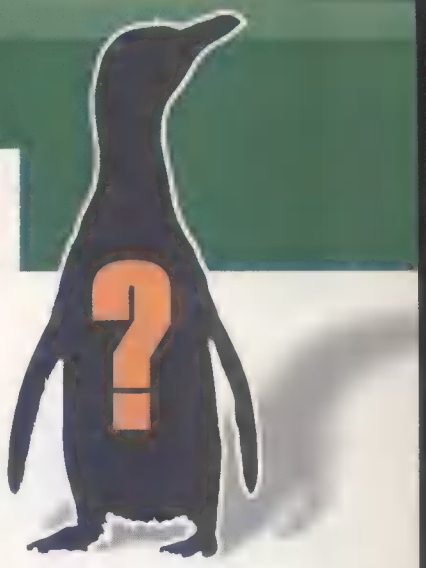


Colonel Corruption

Is it true that the Linux kernel may become corrupt after you install a piece of software on your system, thus requiring one to reinstall the kernel? I can't seem to remember where I heard this—for all I know I may have dreamed it up. But if it's true, why would Linux be favored over other OSes when it can't even stay standing? I still believe Linux rocks! Don't go thinking that I worship Windows, I don't!

—Vortex

The Penguin responds: No! That is absolutely not true. The Linux kernel is very stable. However, there are times when one executes code that wasn't written properly, and that may cause what is known as a "kernel panic." These are rarities in the modern Linux world and, more often than not, are related to code that's touching the hardware in an unpleasant way.

You may be describing a more common phenomenon called a "core dump," in which there is a large file dump of memory and register contents along with other debugging information. But core dumps aren't critical situations—they're just taking up space on the hard drive and alerting you that something is awry within a program.

I've had to reinstall a kernel only once, after my notebook didn't "suspend" properly and some data was corrupted on the drive. But I would chalk that up to a hardware issue, and not Linux or the kernel itself. It's also worth noting that reinstalling a kernel is not as devastating a task as you might expect. As a result of the way Linux is set up, all or most of your previously installed programs should work afterward—unlike Windows 9X, where the registry would be all out of whack and everything would need to be reinstalled again.

A Night at the Proxbury

I currently have a network running Win98. I run three PCs through a single proxy connection. Will Linux support a network proxy to my setup? I want to do this because I'm tired of having to reboot my server every time Win98 crashes.

—Aaron Ashenfelter

The Penguin responds: The answer is a resounding yes. There are many proxy servers available for Linux—for free! Most of the popular web servers out there, such as Apache, have proxy servers that you can set up fairly easily. Some of them even do ad busting, so you don't get banner ads in web pages. But if what you want is Internet access for the computers on your home network, look into masquerading, a topic on which we've thoughtfully provided details, found on pages 37–39. Aside from web browsing, masquerading will also allow you to use popular applications such as ICQ, VDO-Live, IRC, CU-SeeMe, and FTP. And yes, you'll be able to play *Quake* on the net.

A Night at the Proxbury 2

I would really like to use my Linux server as a proxy. I have everything working except Diald. I can access the web and use any multiplayer games through the firewall—I just have to go over to the Linux box and bring up my PPP connection.

Unfortunately, my ISP uses PAP and I don't know how to make Diald work using PAP. Is there a way to make this work? Or is there some other equivalent program that I could use? I could probably program one, but I'm really lazy.

—Geoff "El Jefe" Danielson

The Penguin responds: pppd does support PAP—the trick, of course, is to get it working. pppd uses two files for PAP authentication: /etc/ppp/options and /etc/ppp/pap-secrets. Essentially, your options file holds your username (and lots of other stuff), and the pap-secrets file holds your password (and lots of other stuff).

Add the following line to your /etc/ppp/options file, in which "user" is the username your ISP gave you:

```
name user user
```

Now add the following line to your /etc/ppp/pap-secrets file, in which "user" is the username your ISP gave you and "password" is your password:

```
user * password
```

Now, fire up your pppd.

You can find more information on this topic at: **www.redhat.com/mirrors/LDP/HOWTO/PPP-HOWTO.html**

You Will Be Assimilated

I'm not a Linux guru, though I do plan on joining the cult very soon. What's the best way to update my kernel?

—Bret Sadler

The Penguin responds: Linux is composed of seven different elements: the boot loader (usually LILO), the kernel, the kernel modules (if any), the libraries, the applications, the file system, and the configuration files and scripts. Some would argue that the operating system is comprised solely of the kernel and modules, but without the other elements, Linux would not be functional.

If you're running an older version of Linux and are looking to bring your system up to date, I would suggest backing up everything you want to save and wiping the hard drive with a new install.

However, if you have a more modern version, I would suggest you simply update the kernel and the libraries. Most problems with applications that are having trouble running under Linux can be traced to library version conflicts. Figure out what applications you want to run and what libraries they need to operate, then download and install the newest kernel and libraries.

Some older applications may flat-out refuse to run, but you can usually get newer versions of these applications that are compiled to use the new library versions. If not, you can recompile the applications yourself after installing new libraries.

Remember, unlike Windows, you always have choices with Linux. Reinstallation of a distribution should be done only when you are short on time and don't want to save much data.

BIRD IS THE WO

Trae McCombs, the site manager for Linux.com, says Linux is a means to world liberation. Why? Because it works, silly goose. And unlike some, uh, other OSes you may be using, Linux is free—as a bird.

Maximum Linux How long have you been using Linux?

McCombs Since September 1996.

Maximum Linux So, you've never used Windows?

McCombs Yeah, actually. The first computer I ever owned was a Pentium 60. How I got it is actually a funny story. I wanted to start teaching rock climbing, but my van was broken into and all my climbing gear was stolen. Luckily, I was insured and got reimbursed by the insurance company. After buying some new gear at cost, I had about $2,000 left over. I had heard about this thing called the Internet, and thought to myself, "That's kind of cool." So, I bought a computer.

The computer was Windows 3.1–based, and I ran that for about three months. Then I ran Windows 95 for about a year or so until I realized just how pathetic it was. In September 1996 I saw this screenshot from Enlightenment, a windowing manager for Linux, and I was like "Wow." I didn't know what Linux was, and I didn't particularly care. All I knew was I wanted to run it instead of running Windows just because it looked better.

Maximum Linux What was the transition like?

McCombs Hard.

Maximum Linux How hard?

McCombs Terrible. I'm not a technical guy at all. I was running Red Hat 3.03, and it took me a month and a half to figure things out. Nobody would help me; the whole attitude at the time was "Read this or read that!" I was used to a Windows world where you don't have to read anything—you usually click around on anything and it works. So transitioning to Linux was really hard for me. I like to classify myself as the first Linux end user because I can't code.

Maximum Linux You still can't code?

McCombs No. I can't. If you put a gun to my head, I might be able to do a "Hello World!" statement with Perl, but that would actually be pushing it.

Maximum Linux Linux has gotten a lot of coverage recently from the mainstream press. Is it a mainstream OS?

McCombs I'm living proof that it is. You could take a person that doesn't know anything at all about coding, programming or computers, give them two PCs that have no operating systems on them, tell them to install Linux and Windows on each machine, and I guarantee they'll have an easier time with Linux. It's more straightforward. The problem for Windows users is that it's hard to unlearn what you already know. But nowadays, you can go out and buy a computer with Linux pre-installed on it. It's easy, and it works.

Maximum Linux What can't you do with Linux that you wish you could?

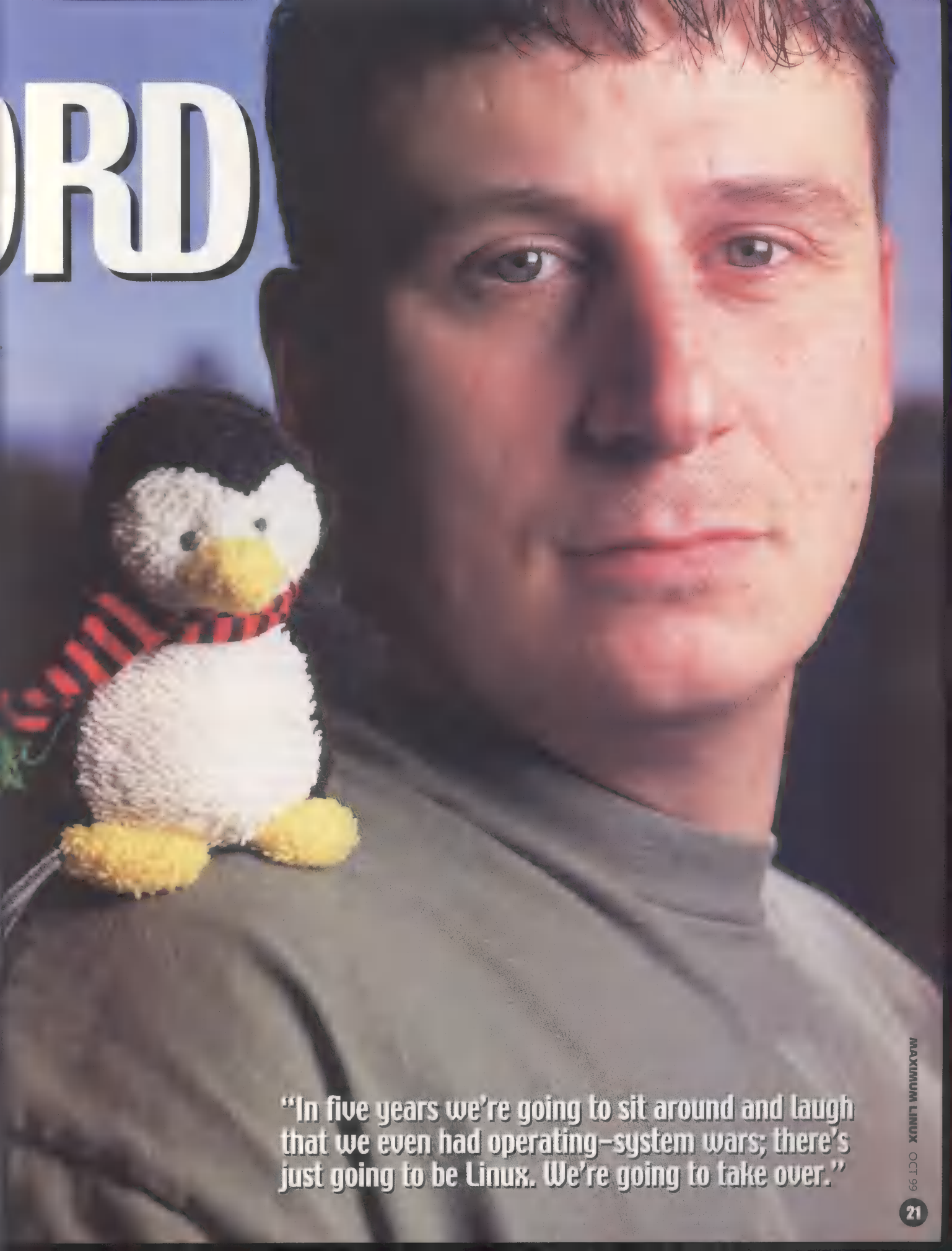
WHO IS THIS GUY?

Name Trae McCombs

Rank Site manager for the Linux.com web site

Mission To make Linux.com the ultimate site for and by the Linux community. To provide a platform for those who don't know much about Linux, but want to.

Last Known Whereabouts Mountain View, CA


"In five years we're going to sit around and laugh that we even had operating-system wars; there's just going to be Linux. We're going to take over."

McCombs [long pause] I don't know. [laughs] This isn't a melodramatic pause, either! I really can't think of anything. Besides, I can always use something like *VMWare* if I feel like I'm out of my element. In fact, all of the new graphics for our t-shirts were created on Linux, using vector-based graphics programs under *VMWare*. In other words, there's really nothing I can't do.

Maximum Linux But how do you convince the average consumer that switching to Linux is necessary?

McCombs That's the million-dollar question, isn't it? Winning the desktop space is what everybody is scrambling to do. People in IT positions are helping us reach that goal, but we need to evangelize and convince all the hardware and software companies that this is the way to go. Once that happens, consumers will follow.

Maximum Linux Games are a pretty big entity on the PC. Is gaming a core focus for the Linux community?

McCombs It depends. I've been running Linux strictly by itself on my own desktop for three years now, so I guess I'm just not used to dealing with games. As far as the mass public goes, yeah, sure they want them. That's going to make Loki rich because their games are so easy to set up and install.

Maximum Linux So, what's taking developers so long to make apps that are compatible with Linux? Are they in bed with Microsoft?

McCombs Look, this isn't about Microsoft, and it isn't about Bill Gates. I run Linux because it doesn't crash and it works. But for those people who do want to address this whole "Let's beat Bill Gates" thing, let's face facts: Microsoft has proven they can beat somebody that has a superior product. And they've proven they can beat somebody that has a superior product that gets released for free. But you can't beat something that's superior and free and that will always be free. It could take three years. It could take two years. Hell, the way this industry goes, it could take six months. But it will happen.

Maximum Linux Do you think the freeware aspect of Linux is so compelling that nothing can doom Linux to fail?

McCombs Bob Young, CEO of Red Hat, always asks, "Would you buy a car with a hood that's welded shut?" I love that analogy. It's the same thing with the operating system. The reason why all these other OSes are not going to work is because of the lack of free upgrades. You're never going to be able to update from Windows NT to Windows 2000 or Windows 2001 for free. You're not going to be able to update to *Office 2000* or *Office 2001* for free. You're never going to be able to do that. Once people realize that updates should be free, operating systems are going to become a thing of the past. In five years we're going to sit around and laugh that we even had operating system wars—there's just going to be Linux. We're going to take over.

"I was used to a Windows world where you don't have to read anything. You usually click around on anything and it works. So transitioning to Linux was really hard for me."

Maximum Linux If it's free, shouldn't sub-$1,000 PC makers be attracted to Linux as their OS of choice?

McCombs Yeah, they should, especially since it'll work on pretty much any type of PC. I even think the government should step in and say, "These are the sorts of open operating systems you should be using." We should be using Linux in the schools. It's an open system. It's public property. It's free. That's the OS people should be learning about.

Maximum Linux But again we come back to the hardware. Why have the major peripheral manufacturers, including the majority of the 3D card companies, been slow to adopt it?

McCombs I don't know. Maybe it's about money? But why spend money on hiring a team of programmers when they can probably get Joe Blow to do it for free in his spare time? It would save them tons of money in R&D. If they send him a couple of cards, in a weekend he'll just whip out the code and the drivers. It makes things so much simpler, and faster.

Many companies, such as IBM and HP, have pledged support for Linux, and they're releasing drivers. What they're doing makes sense, but they need to do more of it. I have an HP printer; I would've bought one of their all-in-one 3100 series products, but it didn't work under Linux. I ended up buying a cheaper model and they lost out on some of my dough. As more people start running Linux, people just like me are going to want to buy hardware that works.

Maximum Linux So, who's spearheading the Linux evangelism efforts? Is there one central figurehead?

McCombs Are you crazy? No! There's no one person. It's not like Linux.com, or Eric Raymond, or Linus Torvalds himself heads up the effort. At one time perhaps they did, but now? Now it's the people.

Maximum Linux But what happens if division hits the ranks? Can the community survive?

McCombs That's a good question. If it happens, the community only has itself to blame. We as people need to make sure that we take care of our planet, and if we screw it up or if we nuke it or if we endanger it, then we as human beings only have ourselves, and our own incompetence, to blame. It's the same thing. It's a challenge to the Linux community to make sure that we hold ourselves together.

Maximum Linux Which has more bugs—Linux or Windows?

McCombs I don't know. [laughs] You'd have to define a "bug." I'm sure there are a lot more bugs in Windows, but I don't want to be seen as a Windows basher because I'm not. I'm Windows agnostic. But due to the nature of the process they have, there's going to be more problems with their operating system, simply because it's not open to peer review. As Eric Raymond says, "If Microsoft ever open-sources Windows, we'll take two or three lines of code from it, merge it in, and just go on."

I update my OS almost daily. You can't do that with Windows. With any closed-source operating system, or any system where you have to wait on a million managers to sign off on every little thing before a change can be made, problems slip through. But if you open it up and have 700,000 people looking at the code base and fixing problems as they find them, chances are that any problems there are going to be caught and fixed.

Maximum Linux Do you think Microsoft will ever go open source?

McCombs No, but if they ever do, Microsoft will have a chance to secure its place in history forever. And if they ever do embrace open standards and submit their code to review, everybody wins.

Maximum Linux Earlier this year, Mindcraft published test results that found an NT server to be several factors faster than a Linux server in file and web serving. The results caused an immediate uproar in the Linux community, which accused Mindcraft of bias. What's your take?

McCombs Benchmarks are crap. Benchmarks don't reflect the real world. IT professionals will attest that Linux is a much more stable system. Before I worked here, I used to manage 15 NT workstations. I constantly had to reinstall software. I had Linux running on my personal desktop the whole time I was there. We set up two file servers—one using NT and one using Linux. Guess what happened? The Linux file server never went down, but the NT box blue-screened every two or three days or so. It just wouldn't work. It's not that I had any bias toward Microsoft or anything because I like things that work easy. I would have used NT because that was my job, but it just didn't work.

There are a lot of people working to show others that the results of that test are bogus. But in my eyes, they're not bogus—they're just irrelevant.

Maximum Linux What do you think of X Windows?

McCombs It depends on what distribution you run and it depends on what you're trying to do. But actually, the question sends chills up my spine.

Maximum Linux What?! Why?

McCombs Because there's no such thing as "X Windows." The original name was actually "W." But that sounded too close to the word "Windows," which was a Microsoft trademark. So they changed the "W" to an "X." But now people just say "X Windows," which is actually incorrect. It's important for people to refer to it as "X Window System" or "X version 11" or "X Window System version 11 r X11." Just plain "X" works, too.

Maximum Linux Why are you so sensitive to that?

McCombs Because Windows is a Microsoft product. People shouldn't think that Microsoft owns a portion of Linux. It doesn't.

Maximum Linux Earlier this year, Linux users requested refunds for the OS they didn't use. Was this Windows protest successful?

McCombs [grins] Oh yeah, I was there, man! It was fun. Anything that brings attention to the open-source movement is a good thing, as long as it's done in a civil manner. It was executed very well. And they had a lot of good beer afterward.

"Microsoft has proven they can beat somebody that has a superior product. And they've proven they can beat somebody that has a superior product that gets released for free."

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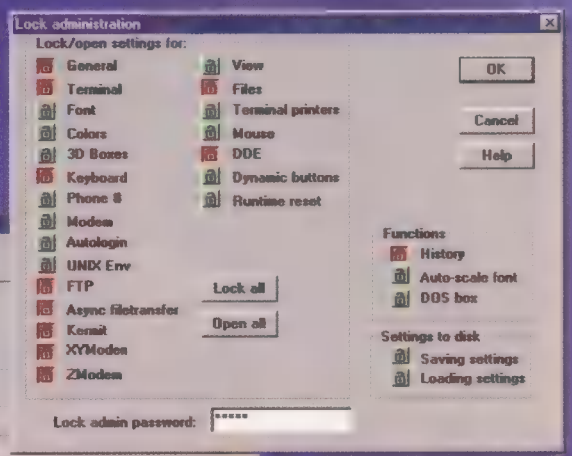

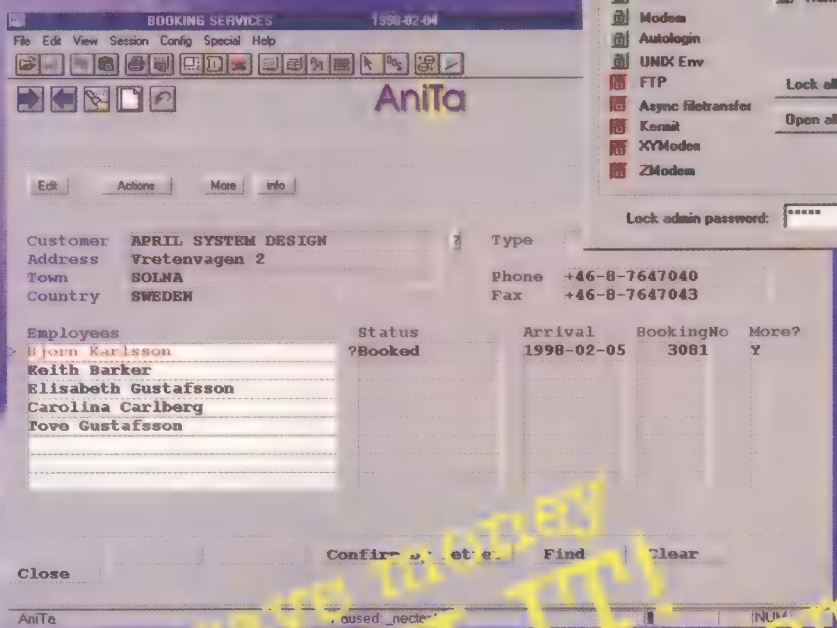

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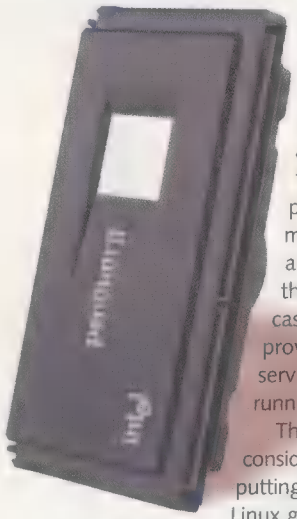
Pengiun Got Game

BY MICHAEL LUTON

If Linux really does kick ass, why do so many Linux users still have Windows partitions on their hard drives? Because when it comes to games, most people think that Linux is still shooting bricks.

Can't hack the thought of booting up an inferior operating system every time you wanna frag? The good news is, you don't have to.

CHOOSING THE RIGHT HARDWARE

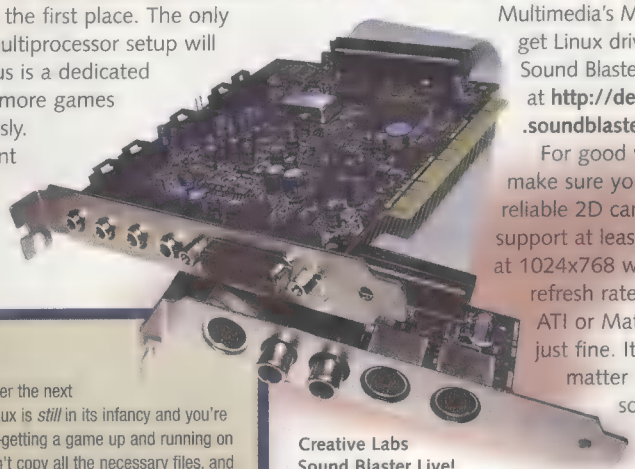


Pentium II

The brains and muscle of your Linux gaming machine should be at least a Pentium II or Celeron-class CPU, running at 350MHz or faster with at least 64MB of RAM. Of course, with RAM as cheap as it is, you might as well shoot for 128MB. Though Linux supports multiple processors, you won't really see a performance increase in your games since none are programmed to take advantage of more than one CPU in the first place. The only case in which a multiprocessor setup will prove advantageous is a dedicated server with two or more games running simultaneously.

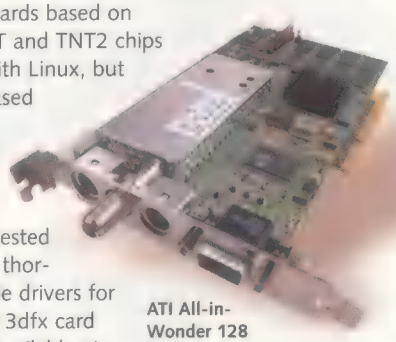
The most important considerations when putting together a Linux game machine are the peripheral items, such as video and sound. It's no secret that Linux just doesn't support as much hardware as Windows does. The good news, though, is that the best hardware from Creative Labs, 3dfx, and nVidia is supported under Linux. So, your choices are limited, but they're pretty damn good choices.

On the audio front, Creative Labs' Sound Blaster products are the most widely supported soundcards under Linux. Most installations will automatically detect a Sound Blaster card and install the necessary drivers for you. If you absolutely have to have that newfangled 3D sound that's all the rage, your only choice is Creative's Sound Blaster Live!, since Aureal doesn't currently offer Linux support for any of the common A3D-compatible cards, such as Diamond Multimedia's MX300. You can get Linux drivers for the Sound Blaster Live! at **http://developer.soundblaster.com/linux/**.



Creative Labs Sound Blaster Live!

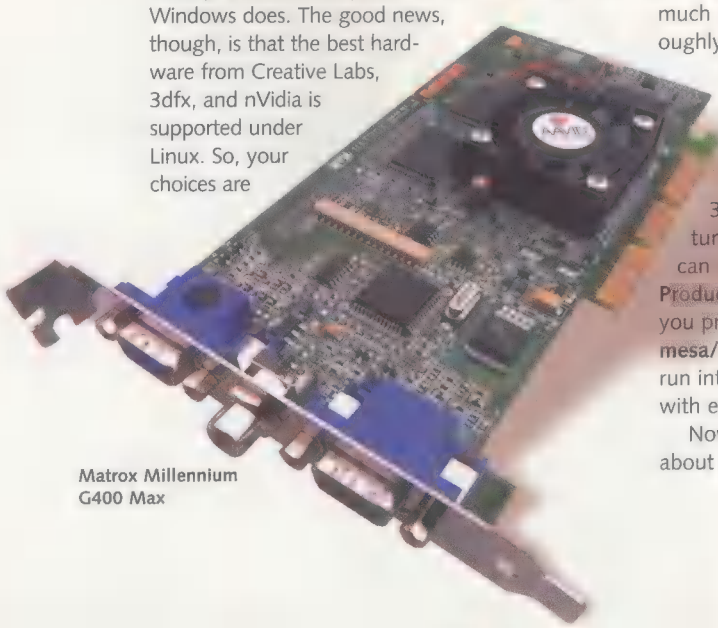
For good visual mojo, make sure you have a reliable 2D card that can support at least 16-bit color at 1024x768 with a decent refresh rate. Anything by ATI or Matrox will do just fine. It doesn't matter if it doesn't scream in 3D or support OpenGL, because you'll want to slap in a couple of Voodoo² cards for that task—yes, cards based on nVidia's TNT and TNT2 chips will work with Linux, but Voodoo²-based cards have been around longer and have been tested much more thoroughly. Glide drivers for your 3dfx card are available at **http://glide.xxedgexx.com/3DfxRPMS.html**.



ATI All-in-Wonder 128

If you absolutely must have the 32-bit color depth and higher-resolution textures that the TNT2-based cards provide, you can grab the drivers from **www.nvidia.com/Products.nsf/htmlmedia/software_drivers.html**. If you prefer rpm files, go to **ftp://ftp.mesa3d.org/mesa/misc/nVidia/**. Just don't be surprised if you run into a few more bugs, since you'll be dealing with early versions of the drivers.

Now that you have the hardware, let's talk about software.



Matrox Millennium G400 Max

Installation Hell Or High-Water

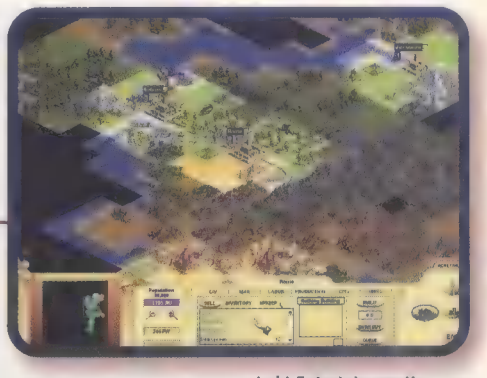
There are several high-quality games currently available for Linux, and over the next several months that number will increase dramatically. But gaming on Linux is *still* in its infancy and you're likely to run into problems during installation. All right, why sugarcoat it—getting a game up and running on Linux can sometimes be a real hassle. Some install programs fail and don't copy all the necessary files, and it's up to you to figure out which ones got left behind. Sometimes your mouse will act as though it's having a seizure, and you'll have to dive into system configuration files to fix the problem. Maybe your sound is choppy or you're getting some cryptic errors. These are ugly scenarios, but there is help out there. If you're dealing with a retail game, you can always contact the publisher's technical support line—but you might be better off hitting the web first. The Linux community supports its own very well, and there are numerous of resources dedicated to supporting Linux gamers, including **www.linuxgames.com**, **www.happypenguin.org**, and our favorite, **www.linuxquake.com**.

Good luck and happy gaming!

HEEDING THE CALL OF GAMERS EVERYWHERE
LOKI ENTERTAINMENT

Loki Entertainment was formed in December 1998 for the sole purpose of porting best-selling computer games to Linux. Founder Scott Draeker figured that of the estimated 10 million Linux users in the world, tons were dying to play games on their operating system of choice—yet, there were few commercial-quality games available.

Draeker and his team went to work filling that void. Their effort paid off a month later when Loki signed an agreement with Activision to produce a Linux port of *Civilization: Call To Power.*



Loki Entertainment's port of Civilization: Call To Power is the first shrink-wrapped game for Linux that you can walk into ■ store and buy.

Civilization: Call To Power

Our sister magazine *PC Gamer* voted Sid Meier's original *Civilization II* the best game of all time for a good reason—it's an amazingly addictive turn-based empire-building game that keeps players awake until the wee hours of the morning just to get in one more turn. Activision's follow-up had no input from the original creators, Sid Meier and Brian Reynolds, and it shows—*Civilization: Call To Power* received a lukewarm response at best. Still, Loki did an excellent job on the port, and *Call To Power* has secured its place in history as the first shrink-wrapped game for Linux that you can walk into a store and buy.

Myth II: Soulblighter

At press time, Loki is putting the finishing touches on Bungie's critically acclaimed *Myth II: Soulblighter*. With any luck, it should be available by the time you read this. In 1997, *Myth* breathed new life into the stagnating real-time strategy genre by offering a true 3D landscape, free-roaming camera, and no annoying resource management. Your troops were your resources, and you were forced to think through your battle tactics before sending your dwarfs, archers, and berserks off to fight. *Myth II* is keeping everything good about the original and adding improvements based on user feedback from the first game. The game also includes a bonus: unit and map-editing tools named Fear and Loathing, respectively.

If you're the kind of gamer who prefers to think instead of shoot, *Myth II* is one title you cannot miss.

Loki Installation

Loki's games are just as easy (if not easier) to install as their Windows counterparts. Just insert the CD, mount it, and type `./setup`. A graphically based installation wizard will take you through the rest of the process. You'll even get an .xpm file to use as an icon and a sym link in /usr/bin. Why can't they all be this easy?

Warlocks, berserks, warriors, and dwarfs all do battle in the one of the bloodiest confrontations of Myth II: Soulblighter.

The Future of Loki

Loki is taking the Linux gaming market very seriously. Now that *Myth II* is in the bag, the company is hard at work on *Railroad Tycoon: Gold Edition*, which will include the original game plus patches and the "Second Century" mission pack. For those who think wistfully of Windows' solitaire game, Loki will soon be distributing *Eric's Ultimate Solitaire*. Saving the best for last, before the end of the year we should also see a port of *Heretic II*, one of the best but most overlooked games of last year.

Loki expects to port about seven more games by the end of 1999, and 16 more in 2000. Linux lovers should get down on their hands and knees and thank their Loki stars.

Moving Large Directories

Computer games can hog more disk space than any other type of application. When trying to install a 500MB behemoth, you may need to move some stuff around between your various partitions to make room. Our resident Unix guru uses this neat trick to move large directories around:

mkdir /newdir	This is the directory to which you're going to be moving files.
cd /olddir	Switch to the directory containing the files you want to move.
tar cf - . | (cd /newdir; tar xpf -)	This is where the magic happens. All the files are "thrown up in the air," tarred, and then extracted to their destination directory with ownership rights still intact.
cd ..	Switch to one level up from the directory you are moving.
rm -fr olddir	Kill everything in the old directory. Be extremely careful with this!
ln -s /newdir olddir	Create a symbolic link to the new directory so your system will never know anything has changed.

WARNING! Here's a word from the wise: Never try this with your /bin or /lib directories! Very Bad Things will happen if you try to move the /bin or /lib directories, and you'll be left unable to execute basic commands.

QUAKE III ARENA

With curved surfaces and 24-bit textures, Quake III Arena is the best-looking game on the planet right now. It's also hella fun!

Unless you've been living in a bomb shelter for the past few years, you're undoubtedly aware of id Software's magnum opus, *Quake*. *Quake III Arena* is the third installment in the series, but unlike the previous two, this one focuses exclusively on deathmatches and leaves the story-based missions in the dust. The beauty of *Quake III* is that even without an Internet connection, you can experience the carnage by playing against computer AI opponents. The retail version of *Quake III Arena* won't be available until later this year, but you can download and play the limited test version right now. The test contains three maps but no computer AI.

Quake III Installation

Quake III is one of the easiest games to set up under Linux. First, download and install the 3dfx Glide drivers (see below). Then download *q3test-linux-1.07-glibc-4.i386.rpm* from **www.quake3arena.com**. To install *Quake III*, enter into a shell: `rpm -i q3test-linux-1.07-glibc-4.i386.rpm`. This will copy the files to the default location of /usr/local/games/q3test. You can specify your own directory by using the `--root=/your/dir/` choice with the `rpm` command.

Now, fire up *Quake III* by typing `./linuxquake3 +set r_glDriver libMesaVoodooGL.so.3.1` from the q3test directory. You might want to put this command in a shell script, to save yourself some typing the next time around.

QUAKE CLASSIC

If you can't wait for the retail release of *Quake III Arena* for Linux, get your gaming fix from the original *Quake* games. *Quake: The Offering* and *Quake II: Colossus* bundle the original games along with their mission packs and should be available in most stores. And though *Quake I* and *II* shine the brightest in OpenGL, you can still run the software-rendered versions if you're a little behind the times.

Quake I & II Installation

Slap the CD in the drive and execute the following two commands:

```
mount /dev/cdrom /mnt
# /bin/sh /mnt/setup
```

Hint: If during setup you encounter a situation in which the files being copied conflict with files that already exist, don't sweat it; just manually install the necessary rpm files from the CD. If you still get errors, enter `--replacefiles switch` with the `rpm` command.

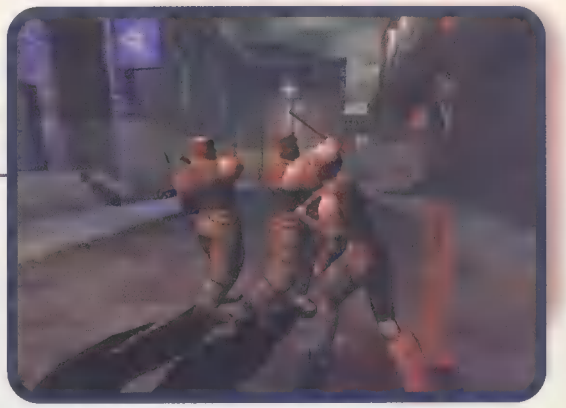
Another hint: You may run into sporadic mouse-control issues when first playing *Quake* or *Quake II*. Be sure you have specified the correct mouse type in your /etc/vga/ibvga.config file—look for the line near the top of the file that reads `mouse mousetype`, or something similar. Don't be afraid to experiment with different values until you find the one that works best for you. For example, we tried one of Microsoft's old-fashioned mice, but *Quake* wouldn't respond to it properly until we specified it as PS/2. Also, shut down all GPM services by issuing the command `killall gpm` while logged in as a root user.

Two games, four mission packs—all the Quake you'll ever need is inside these two boxes.

Yet another hint: If these tips still don't solve your problems, check out **www.linuxquake.com**, the site with the most complete documentation we know of that's aimed at getting the *Quake* games running under Linux.

KINGPIN

The latest entry to the first-person-shooter fray, *Kingpin* places you in the shoes of an up-and-coming hoodlum who's been left for dead on Skid Row by some rival gang members. Your goal is to exact revenge on those thugs and work your way up the organized crime ladder to become the top dog, the Big Daddy... the Kingpin.



These guys have been listening to Prodigy's "Smack My Bitch Up" a little too much. At least she's smacking back.

Kingpin Installation

Installing *Kingpin* on Linux can be a true test of patience. The current patch is still in early beta, and users have had various degrees of success in getting it to run. Following is an outline of the basic steps required to set up *Kingpin* on Linux—but don't be surprised if after all the work, it still doesn't run on your system. Such is the life of a bonafide beta tester.

The retail version of *Kingpin* is for Windows only, so you'll first need to fully install it under Windows. If you run Windows and Linux on the same machine, you can boot into Linux, mount your Win32 drive, and copy the files to your Linux partition. But if you run only Linux, with no Windows partitions whatsoever, you'll get to experience the joy of FTPing about 530MB from your Windows machine to your Linux machine. Whatever you do, be sure to put the files into a directory called /usr/local/games/kingpin.

Kingpin for Linux was built on Red Hat 6.0, so you'll need *glibc 2.1* in order to run it. Red Hat 5.2 users will have to download and install *glibc 2.1.1-6.i386.rpm* from one of the sites listed on **www.redhat.com/download/mirror.html**. Use `rpm -i --force --no-deps --root=/root /glibc2.1 glibc-2.1.1-6.i386.rpm` to keep it separate from your 2.0 libraries.

Download the latest version of the *Kingpin* client from **impact.frag.com/ridah/kptest/**. The current version is 1.14, but by the time you read this there will probably be a newer one available. Install it with `rpm -i kingpin*rpm`.

You're almost there! Go to the main directory under *Kingpin* and run `./ccase -r *`. This will make all the filenames in your *Kingpin* distribution lowercase, which is important in a case-sensitive environment such as Linux.

Now we're ready to start up *Kingpin* with the following (rather long-winded) command:

```
./kingpin +set vid_ref glx +set
 gl_driver libMesaGL.so.2.6 +set
 cd_dev /dev/cdrom
```

Save yourself some headaches and put this in a shell script so you only have to type it once.

If you're running Red Hat 5.2 and you installed the *glibc 2.1* libraries as instructed above, be sure *Kingpin* is set to look to the right setup libraries when it starts up. This bit of Unix acrobatics comes courtesy of "drig" from the *Kingpin* forum at **www.linuxgames.com**.

```
env LD_LIBRARY_PATH=/
 root/glibc2.1/lib/ \
 /root/glibc2.1/lib/ld-linux.so.2
 ./kingpin \ +set vid_ref glx
 +set gl_driver libGL.so.1 \
 +set cd_dev /dev/cdrom
```

If the gods are smiling upon you, *Kingpin* will start up properly. If not, you can either wait for a more stable Linux patch or search for help and information on the *Kingpin* forum at **www.linuxgames.com**.

Based on a heavily modified Quake II engine, Kingpin features some of the best graphics this side of Unreal.

Console Emulators

Today's cutting-edge 3D-action and strategy games are great, but it's nice to take a trip back to the classic games of yesteryear. Following are details on three of the many emulators available for Linux. All come with full source code, so if you're inclined, you can modify any of the programs to your heart's desire—and maybe even contribute to their ongoing development. And remember folks, unless you actually own the original cartridges for any ROMs you play, you could be considered an outlaw by various state and federal law-enforcement agencies.

X-MAME, xmame.retrogames.com, mame.retrogames.com
As you can perhaps tell from the name, X-MAME is an X11/Unix port of the popular Multi Arcade Machine Emulator. It can emulate pretty much all arcade machine games from the 1970s and 1980s; more than 500 games are supported.

You'll have to fire up your compiler to install X-MAME on your system. After extracting the source files, edit the makefile.unix and provide information specific to your system. Now compile the source using the command `make -f makefile.unix`. If the compile completed successfully, you can you install X-MAME using `-f makefile.unix install`.

NEStra, nestra.linuxgames.com
NEStra emulates the old Nintendo Entertainment System console and uses some assembly code for an extra speed boost. The keyboard is your only control device option, but you can remap the keys according to whatever setup gets your mojo working. You can also alter the emulation speed, which can come in handy for skipping past long introductions or impressing your friends by playing Mario Brothers at quadruple speed. Compiling NEStra is as easy as typing `make` in the source code directory.

DGen/SDL, www.humboldt1.com/~ognir/dgen-sdl.html, www.dtmnt.com
Remember the Sega Genesis system? The DGen/SDL emulator is keeping that console system alive on Linux. It's based on the Windows version of DGen, developed by a man known only as "Dave." DGen on Linux makes use of the SDL library for graphics and sound—hence the SDL appended to the name. DGen/SDL is distributed as source code like the other emulators mentioned here, but if you don't want to mess around with compiling it, you can also download a binary release from its web page.

SERVER SETUP

DISHING UP A PLATEFUL OF GAME GOODNESS

Linux makes a good game server for the same reason it makes a good web server: It consumes fewer resources, so you can run games on a lower spec machine and still deliver lag-free action for a respectable number of players. Its multitasking nature allows you to run several game servers simultaneously and reliably without taking a big performance hit—though, of course, the more memory and CPUs you have, the better off you'll be. Linux's stability also means you can let a game run for weeks at a time and never worry about it crashing. Here's how to make your Linux box serve up fresh *Quake* deathmatches.

Server Browsers

Playing *Quake* on the Internet is much easier when you have a nice graphical server browser to tell you where all the good servers are. Unfortunately, the mother of all game server browsers, GameSpy, doesn't exist on Linux. But all is not lost—a few motivated programmers have provided their own versions that will do the trick nicely.

QStat, www.activesw.com/people/steve/qstat.html
QStat is a command-line utility that queries game servers and retrieves various statistics from them. It runs on most versions of Linux and Unix, and even on Win32 platforms. Most current first-person-shooter games are supported.

XQF, www.linuxgames.com/xqf/
XQF, a graphical front-end by Steve Jankowski, is probably the most popular of the X11-based server browsers. It supports any *Quake*-engine-based game and includes a favorites list so you can keep tabs on the servers you frequent. XQF also includes "Buddy Lists" so you can easily find where your friends are playing. XQF looks to give GameSpy a run for its money if its development trend continues.

X11Spy, www.linux3d.net/x11spy/
X11Spy is another graphical front-end for QStat, concerned only about *Quake III*. It's early in its development cycle (the current version is 0.1), but it can easily hunt down *Quake III* servers. The latest version allows you to filter servers based on player names and pings, letting you track your friends or enemies. You can also find servers where the players have similar pings to your own, thus ensuring you don't get mixed up with a bunch of low-ping bastards when you've got a 300+ ping.

A Quake III Test Server

If you have an extra machine and want to provide a fun service for others on your network, try running a *Quake III* Test server. Here's everything you need to get started.

The first obvious step is to download and install the *Quake III Arena* test as described on page 28. In this case, though, don't worry about 3D card drivers. The second step is to create a file in the demoq3 directory called server.cfg, with the following contents:

```
-set sv_maxclients 16
-set sv_hostname
 "My Battleground"
-set g_motd "Welcome to
 The Battleground.
 Prepare to die!"
-fraglimit 30
-timelimit 20
-set map1 "map q3test1;
 set nextmap vstr map2"
-set map2 "map q3test2;
 set nextmap vstr map3"
-set map3 "map q3tourney;
 set nextmap vstr map1"
-vstr map1
```

Let's go over each line in a more detail:

sv_maxclients This is the maximum number of user connections that can be made to the server. This number includes both players and spectators.

sv_hostname This is the name of your server as it will appear in server browsing programs like GameSpy and XQF.

g_motd This is a message that displays on screen when players first connect to your server.

fraglimit and timelimit The first person to hit the fraglimit wins the match. If no one reaches the fraglimit, the match is over when the timelimit is up.

Map Rotation This is the biggest change in *Quake III*. These next three lines basically set simple string variables. It just so happens that these strings contain commands to load a map and set the "nextmap" variable. The `vstr` command executes commands contained in a string. It may be arcane, but it works and gives server ops total control over which maps they run and in what order. The last command in the file should load the first map, and no other commands should be placed after it. In this case `vstr map1` loads the first map and primes the pump for the second one.

Start the server with the command `./linuxquake3 +set dedicated 2 +exec server.cfg`. Now, watch your company's productivity go down the tube. To stop the server, and hence increase productivity, type `quit`.

YOU GOT GAME

After reading this, you may come to the conclusion that the vast majority of games currently available for Linux are based on the *Quake* engine. Since ports of the original *Quake* games have always existed, it's only reasonable that other games based on that code would also have Linux ports. It's a good thing that companies like Loki are providing ports of good non-*Quake* games such as *Civilization: Call to Power* and *Myth II: Soulblighter*, adding balance to the *Quake*-heavy supply of Linux games. These titles prove that Linux isn't just for servers anymore and that the millions of Linux users who play games can do so on their favorite operating system without rebooting to Windows.

Sure, sometimes installations can be a little more difficult than necessary and you may have to do some troubleshooting to make sure everything is working right. But in time, installations will get easier and the number of games will definitely increase. The future of gaming on Linux is looking brighter everyday, so if you haven't already, go out and buy one or more of the games mentioned here and experience the joy of Linux gaming for yourself.

Questions or comments? e-mail us at **editor@maximumlinuxmag.com**

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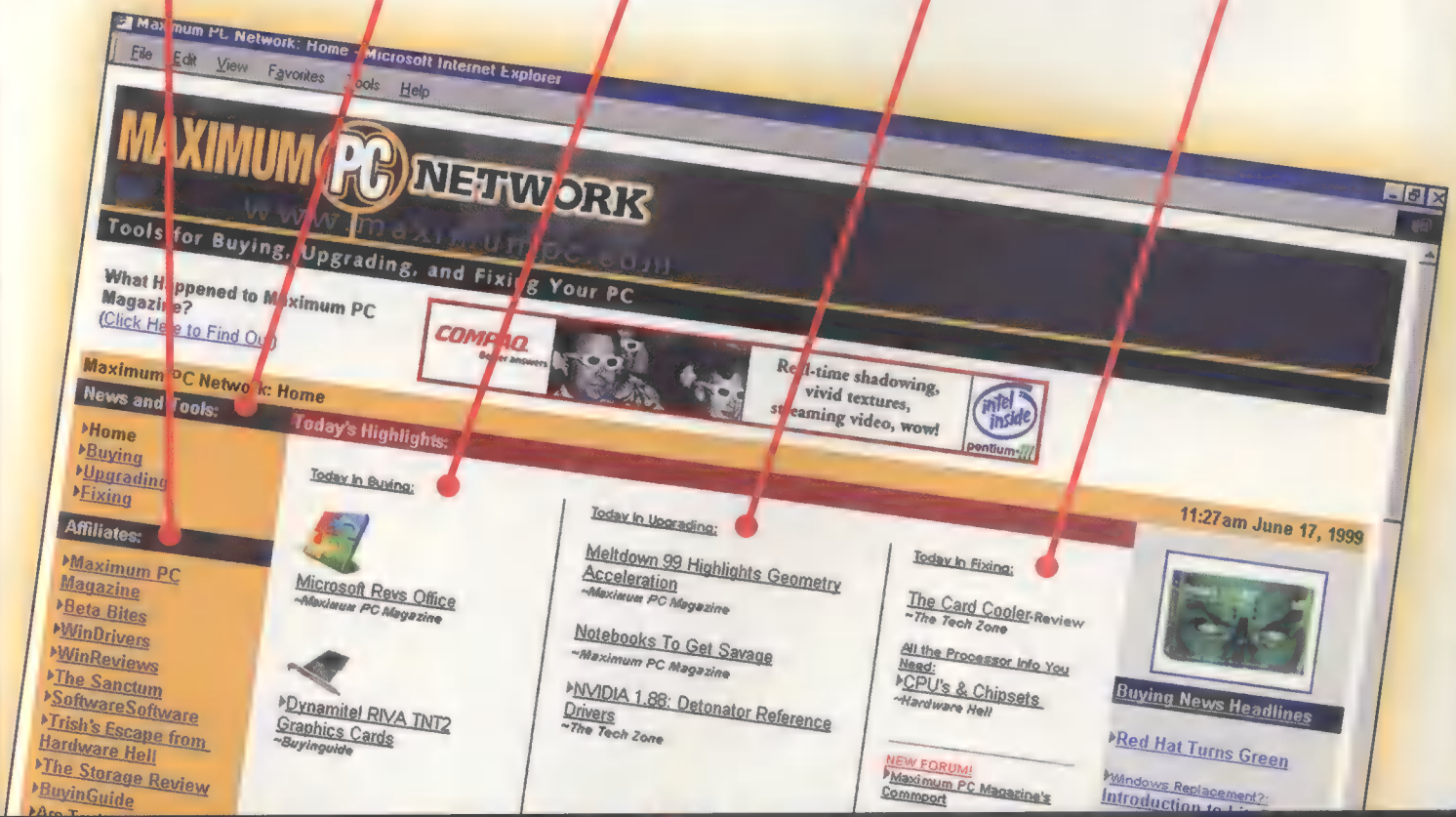


www.maximumpc.com

12-Step Program

A HANDY GUIDE TO INSTALLING LINUX-MANDRAKE 6.0

We admit it: Linux used to be a real pain to install. But as Linux's popularity has increased, so has the simplicity of its installation process. Gone are the days of manually stitching together all the components needed for a working operating system. Now, Linux installation is a wizard-driven process, creating the sort of user-friendly environment we've grown to expect from commercial software.

Below are 12 detailed steps that will lead you through the installation of Linux-Mandrake 6.0, the very Linux distribution we've included on this month's *Maximum Linux* disc. The process is quicker than a phone call to your mother, and probably a lot less painful.

—Keith Beattie

Before you embark on your magical, numerical adventure, there are a few things you should do:

GATHER THE FACTS

Depending on the type of hardware in your machine, the Linux-Mandrake installation process can be almost completely automated. In fact, you may get through most of the installation by pressing just the spacebar and tab keys. However, as you Eagle Scouts know, it's good to be prepared for anything, so in anticipation of surprise questions, take a minute to note the number, types, and sizes of your hard drives; how much RAM you have; the type of CD-ROM you're using and whether it's IDE or SCSI; and the type of mouse you're using. Also, jot down the brand of graphics card in your system; the amount of video memory your machine boasts; the monitor's make and manufacturer, and the maximum screen resolution and color depth it'll support. If you plan to surf the Internet, also note information about your network card (if you have one) and your ISP's phone number and IP address.

PREPARE THE PARTITIONS

At a minimum, you must have 600MB of available disk space on your system in order to install Linux-Mandrake. So, if you're planning to set up a dual-boot machine with both Linux and Windows, you may need to delete data in order to free up space. Don't futz around with fdisk to create, delete, or add partitions to your hard drive, because many Linux distributions bundle such utilities for you. Linux-Mandrake has thoughtfully included two handy programs, FIPS and DiskDruid, both of which do essentially the same thing: break one disk partition into two. Still, proceed with caution—repartitioning can be tricky. Take care to back up any irreplaceable data and watch out for dialog boxes containing warning signs.

DECISION TIME

The simplest way to install Linux is to boot your machine from the CD. If your machine isn't set up to boot from a CD, you'll need to scope out your BIOS and make some changes. If you're using an old PC (with an even older BIOS) that won't allow you to boot from the CD, take heart: You can still make do with a bootable floppy. This can be done by using the rawwrite program (located in the /dosutils/ directory on the CD) and specifying the /images/boot.img as the image source file for the boot disk. Have on hand a boot disk for DOS or your existing OS, in case there's a problem with your hard drive while installing—you know, better safe than sorry, and all that rot...

The installation class you choose will affect the way your machine will be configured with Linux. You have three choices: workstation, server, and custom. The workstation and server classes make assumptions about how you'd like your machine configured and what software you want installed. These assumptions are made for the sake of speed and simplicity. The custom installation class is for gurus who want to tweak each installation step. If you've never installed Linux before, choose workstation. It'll build you a reasonable system with minimal effort on your part.

You're through with the prep work. Stop—Linux time!

ALL THE SOFTWARE YOU NEED IS ON THE MAXIMUM LINUX CD

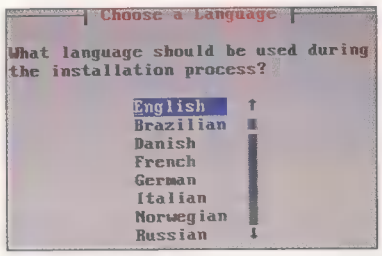
1 Insert the CD

It doesn't get any easier than this. Insert the CD (and the bootable floppy if you need it), then reboot your machine. If you've configured your system BIOS correctly, your machine will greet you with the Linux-Mandrake welcome screen. When you see this screen, select OK.

Linux Mandrake
Welcome to Linux Mandrake!
This installation process is outlined in detail in the Official Linux Mandrake Installation Guide available from MandrakeSoft. If you have access to this manual, you should read the installation section before continuing.
If you have purchased Official Linux Mandrake, be sure to register your purchase through our web site, http://www.linux-mandrake.com.

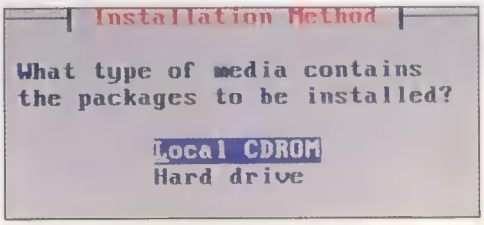
2 Show your passport papers

The first selections you'll be asked to make concern your language and keyboard settings. These couldn't be easier to deal with—just highlight the language of your choice. There are 23 languages represented, including Finnish, Norwegian, Italian, and Polish. Once you've chosen your allegiance, pick your keyboard from the list.



3 Where's Waldo?

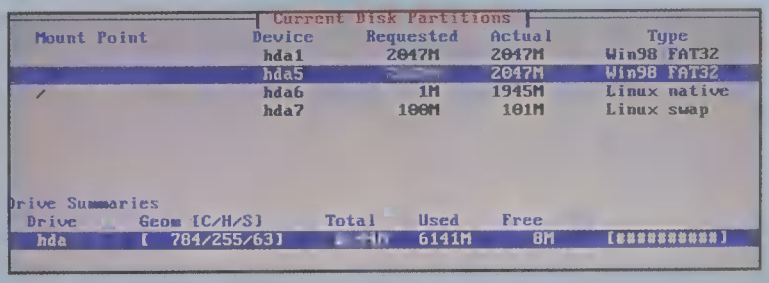
Next, specify where the installation is coming from. You have two choices: CD or hard drive. If you're running off the CD, choose "Local CDROM." Otherwise, select "Hard drive." For now, everything we need is located on the CD.



FOR ADVANCED USERS ONLY!

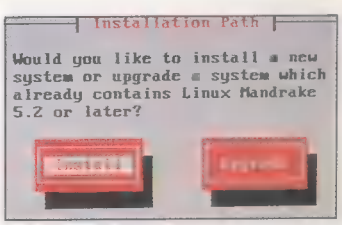
If you choose custom, you'll be prompted to choose either DiskDruid or fdisk to handle your partitioning duties. We suggest you choose DiskDruid because it's more robust. Once you've decided which partitions to add or delete, you'll have to designate one partition as your Linux swap space and the other as your Linux native space. To do this, enter the mount point (a forward slash to signify the root directory) on the partition of your choice. You should also select the "grow to fill disk" option.

If you just finished reading this, are not an advanced user, or are now experiencing heart palpitations, fear not, dear friend. Choosing workstation will ensure that the installer handles all the selections for you.


Current Disk Partitions
Mount Point Device Requested Actual Type
hda1 2047M 2047M Win98 FAT32
hda5 2047M Win98 FAT32
/ hda6 1M 1945M Linux native
hda7 100M 101M Linux swap
Drive Summaries
Drive Geom [C/H/S] Total Used Free
hda [784/255/63] 6141M 0M [##########]

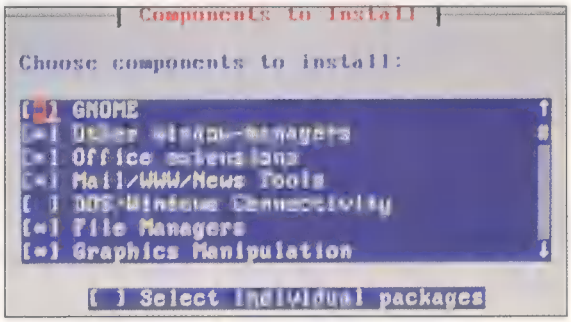
4 Boxers or briefs?

Now the PC needs to know whether you're inundating it with a fresh Linux install or with an upgrade. If you've never installed Linux before, select "Install" as your option, then indicate which type of machine you're running: workstation, server, or custom. Remember—newcomers to Linux should always select workstation. At this time, if you have any SCSI devices installed, the Linux installation will probe them to find out what they are. You may be prompted to answer a couple of questions, but they should be self-explanatory.


Installation Path
Would you like to install a new system or upgrade a system which already contains Linux Mandrake 5.2 or later?

5 Software ahoy!

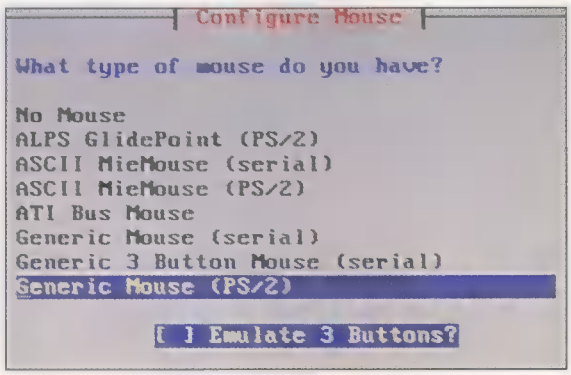
Next up is the installation of the individual packages, sets of programs and their default configurations. You can sit tight while the installer works its magic on this; the workstation option predetermines which packages should be installed, though you can always go back and add or delete packages as you see fit. The installation time will vary from machine to machine, but expect the entire process to take anywhere from 8 to 15 minutes. Our actual install took 12 minutes and 7 seconds—more than enough time to grab a snack and hit the loo.



6 Probing questions

If everything proceeds smoothly, a window detailing a mouse probe should pop up. Don't fret—this is normal. It's just searching the ports for a compatible mouse, so select OK. Several quick screens should follow, requesting details about your mouse, network, time zone, and printers. Tip: When specifying your mouse, check the "Emulate 3 buttons" option if you have a two-button mouse—this will let you emulate the middle mouse button by clicking the two buttons simultaneously. Don't say we never gave you anything...

You will also be asked to configure your time zone; avoid setting the hardware clock to Greenwich Mean Time. Instead, choose the time zone that best reflects your GPS position in your country.

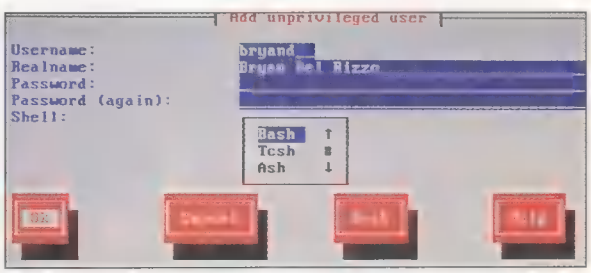


7 I'm privileged. You're not.

Next, you'll be prompted to define the root password. The root account is the privileged super-user account that provides access when the system needs maintenance. This account should not be used for routine tasks. When you're choosing your root password, don't be alarmed if it looks as though you're shooting blanks—for security purposes, everything you type is rendered as a blank on the screen.

Now define an unprivileged user account. This is a simple task: Just type in a username, full name, and password. This is the regular user account that should be used for day-to-day operations of the PC. Accept the default shell. Remember: Everything you type is case sensitive!

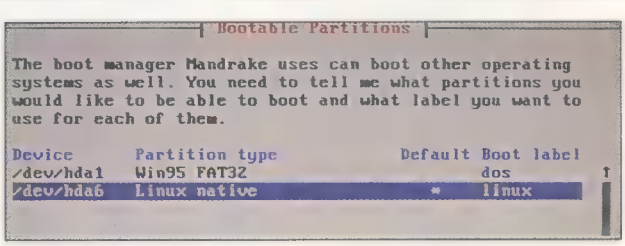
Creating a boot disk is next. Don't do a foolish thing by skipping this step—a boot disk functions as a recovery disk for your system if there's a cataclysmic event like a crash. Have a blank floppy disk handy to use as the boot disk.



8 Loading the boot

You'll next need to define where you want Linux's bootloader to reside. We chose the Master Boot Record, and we think you should, too. When you're greeted with a screen that asks you about "passing special options to the kernel," ignore it. Accept the defaults and carry on.

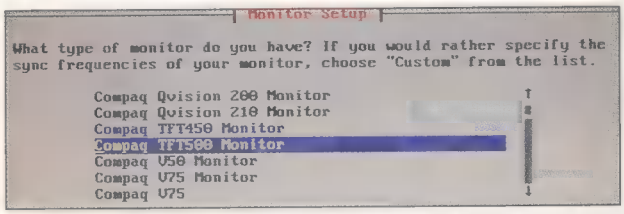
You'll now come to the "Bootable Partition" screen. This is where you can edit the boot labels—the text you'll be required to type at the command prompt when your PC boots up. Linux will appear as "linux," and if you already have Windows installed, it will appear as "dos" (all lowercase). If you choose, you can edit these labels. (We changed "dos" to "win".) In any case, it behooves you to keep the labels short ,since you'll be typing them whenever you boot up your PC.


Bootable Partitions
The boot manager Mandrake uses can boot other operating systems as well. You need to tell me what partitions you would like to be able to boot and what label you want to use for each of them.
Device Partition type Default Boot label
/dev/hda1 Win95 FAT32 dos
/dev/hda6 Linux native * linux

Next, the bootloader will probe your PCI bus. If things go well, it should auto-detect the PCI graphics card currently in your system.

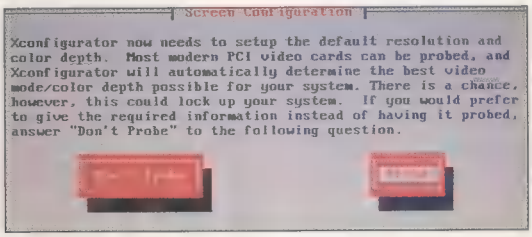
9 Monitor madness

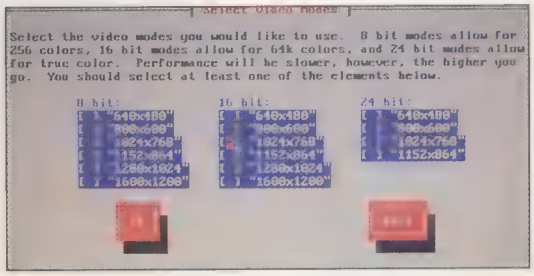
This is pretty simple—just select the monitor of your choice. If your monitor isn't listed, you can select "Custom" and define the specs, including maximum resolutions and refresh rates, manually.


Monitor Setup
What type of monitor do you have? If you would rather specify the sync frequencies of your monitor, choose "Custom" from the list.
Compaq Qvision 200 Monitor
Compaq Qvision 210 Monitor
Compaq TFT450 Monitor
Compaq TF1500 Monitor
Compaq V50 Monitor
Compaq V75 Monitor
Compaq V75

10 Graphics goodies

The final configuration steps involve setting up the videocard and the X server, providing your new system with a graphical user interface (GUI). The Xconfigurator will want to probe your system in order to glean information about your videocard. Let it probe; chances are, it will detect the correct videocard the first time out. If problems do crop up, don't get jittery: You can always select things manually, including the amount of video memory, the screen resolution, and color depth.

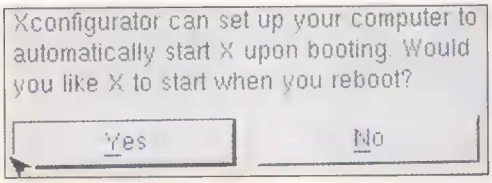

Screen Configuration
Xconfigurator now needs to setup the default resolution and color depth. Most modern PCI video cards can be probed, and Xconfigurator will automatically determine the best video mode/color depth possible for your system. There is a chance, however, this could lock up your system. If you would prefer to give the required information instead of having it probed, answer "Don't Probe" to the following question.


Select Video Modes
Select the video modes you would like to use. 8 bit modes allow for 256 colors, 16 bit modes allow for 64k colors, and 24 bit modes allow for true color. Performance will be slower, however, the higher you go. You should select at least one of the elements below.
8 bit:
16 bit:
24 bit:
"640x480"
"800x600"
"1024x768"
"1152x864"
"1280x1024"
"1600x1200"

11 Can't touch this

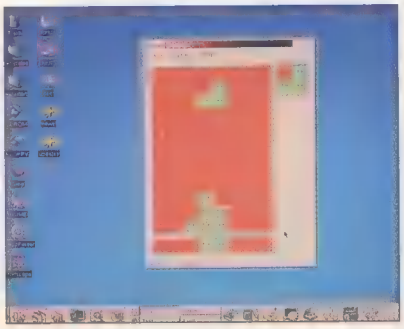
You should now be greeted with a "Can you see this message?" message. If for some reason you receive an "out of sync" message, don't touch the keyboard! There's an automatic 10 second time-out, so if problems do exist and you don't touch the keyboard, you'll be taken back to the monitor configuration screen to try again. If you do get the "message" message, hit OK. At this point, you should have mouse control.

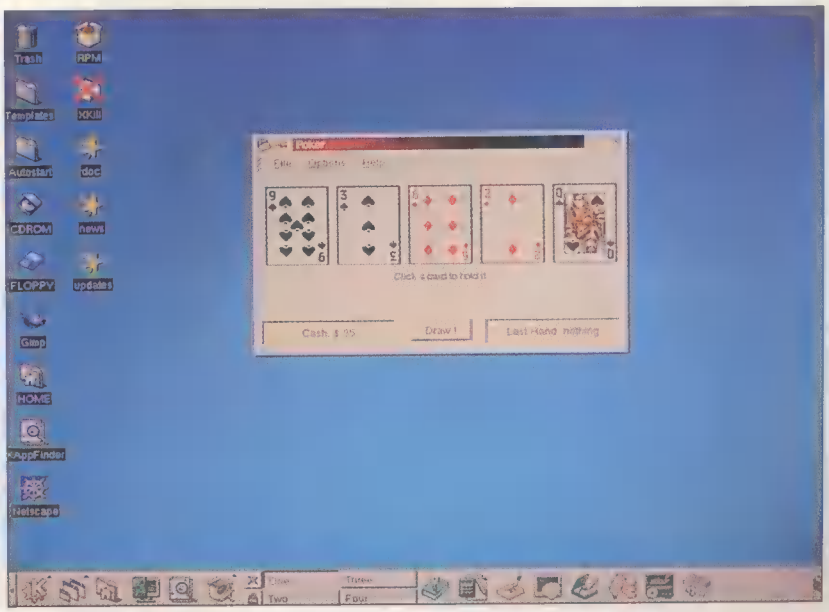
Note: If prompted, choose to start X everytime you boot up the PC.


Xconfigurator can set up your computer to automatically start X upon booting. Would you like X to start when you reboot?
Yes
No

12 You're finished!

The last step is to reboot the system and run the newly installed OS. Remove all disks from all bootable drives and let 'er rip. When you're greeted with the command prompt, type `linux` to load your favorite new OS, and breathe deep. You've done it!





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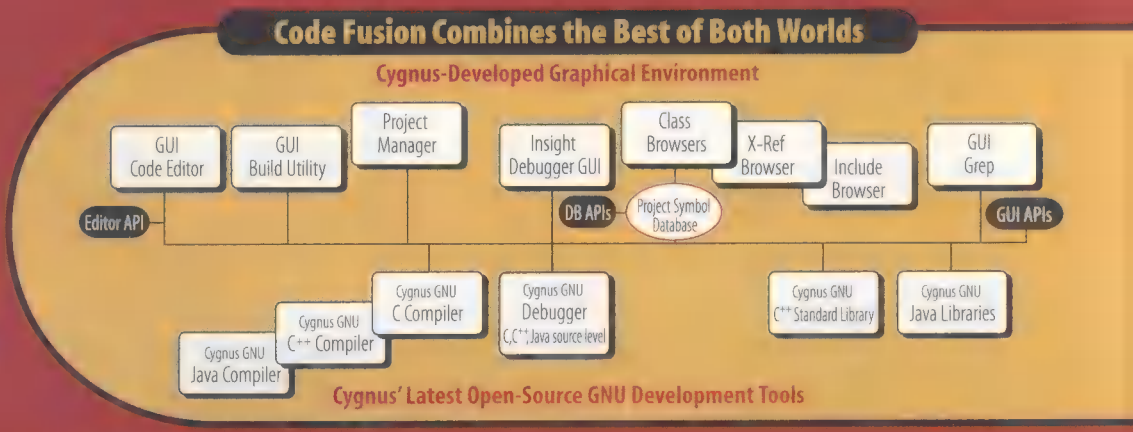

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CYGNUS GNU TOOLS

networking nice guy

I am often approached by people who say to me, "Anders, Linux is great and all, but I wanna get on the net!" I think it's a little weird when this happens, because usually these people are total strangers. But I'm a nice guy, so...

Consider it done, and then some: Here's a step-by-step look at getting not only your Linux box on the Net, but also all the other computers on your home network.

—ANDERS BROWNWORTH

GETTING CONNECTED

No matter what operating system you're using, there are essentially three ways to get connected to the Internet:

- via a PPP connection for a single host—this is the most popular setup for basic home users connecting on one computer
- via a PPP connection with a masquerading firewall—this enables the connection of a virtually unlimited number of machines by way of one truly connected machine
- via a PPP connection routing multiple real IP addresses—this is only for true geeks with lots of time on their hands and an "in" with their local ISP

We'll focus primarily on the second option, and on showing you how to use your Linux box as the router that will get your entire home network connected. And because we know we've gotten some of you all aflutter with the idea of setting up each of the machines on your network with real ISPs, we'll also spend some time looking at the third option.

LOST IN THIS MASQUERADE

You have your home network up and running with your Linux box, and now you're psyched to get on the net. It's a cinch to put your Linux machine in charge of this process, making Internet requests for the other computers on your home network. In this scenario, your other computers aren't really on the Internet, per se; they're accessing it through your Linux box, which is "masquerading" on the Internet as the other machines.

A bonus of masquerading is that others on the Internet who are looking for mischief—or worse—won't be able to establish connections with the computers on your home network. And if they can't directly connect with them, they can't crack into them.

CONNECTING ONE BOX TO THE INTERNET

Connecting your Linux box to the Internet through an ISP is simple when you're using Red Hat's *netcfg* program... so that's what we used. All you really need is a Red Hat box running X Window, an ISP account, and a phone line.

First, log into your Linux system's root account. Type `startx` to launch X if it's not running already. Launch the *netcfg* tool by opening a terminal window and typing `netcfg`. You should now see Red Hat's Network Configurator. Click on the "Interfaces" button to view a list of the network interfaces configured on your system. You can ignore lo, the local loopback device, because it's only used by the computer to talk to itself and has nothing to do with the physical network. You can also ignore eth0, your Ethernet card, because your goal is to add a ppp0 device that will deal with your Internet connection.

First, click "Add." Choose "PPP" from the window that pops up, and enter your local access phone number, username, and password in the following box. Now you'll need to twiddle with the items hidden behind the "Customize" button;

Masquerading vs. IP routing—Auntie Em, which way do I go?

- Masquerading is much easier to set up; IP routing is more involved and requires special settings provided by your ISP.
- Masquerading isn't an option for nonstandard ports; IP routing is OK with any port, anytime.
- Masquerading doesn't support inbound connections; IP routing does.

If you happen to have an ISP that will allocate and route multiple static IP addresses to you (or if one of the tech guys there owes you a favor), you have access to the IP routing option, meaning that each computer on your home network could be assigned its own, real IP address and could use your Linux box as a gateway. Of course, you'd also have to send that entire set of IP addresses through your phone line—and who really has buddies at their ISP anyway?

What we tested on...

Our test machine consisted of a homegrown 350MHz Pentium II with 256MB of RAM, an 8GB IDE hard drive, and a TNT2-based graphics card, running Red Hat 6.0 workstation configuration and kernel 2.2.5.

For definitions of Terminator words, hyperlink to the back of Maximum Linux.

tty settings

DOS - UNIX
COM1 - /dev/ttyS0
COM2 - /dev/ttyS1
COM3 - /dev/ttyS2 *
COM4 - /dev/ttyS3 *
* Try to avoid /dev/ttyS2 and /dev/ttyS3, because they require special setups.

the most important concerns the location of your modem. /dev/modem is the default, but since this isn't defined in a standard Red Hat install, you'll probably want to pick one of the alternate modem port settings. Use the tty chart to figure out which port you should select.

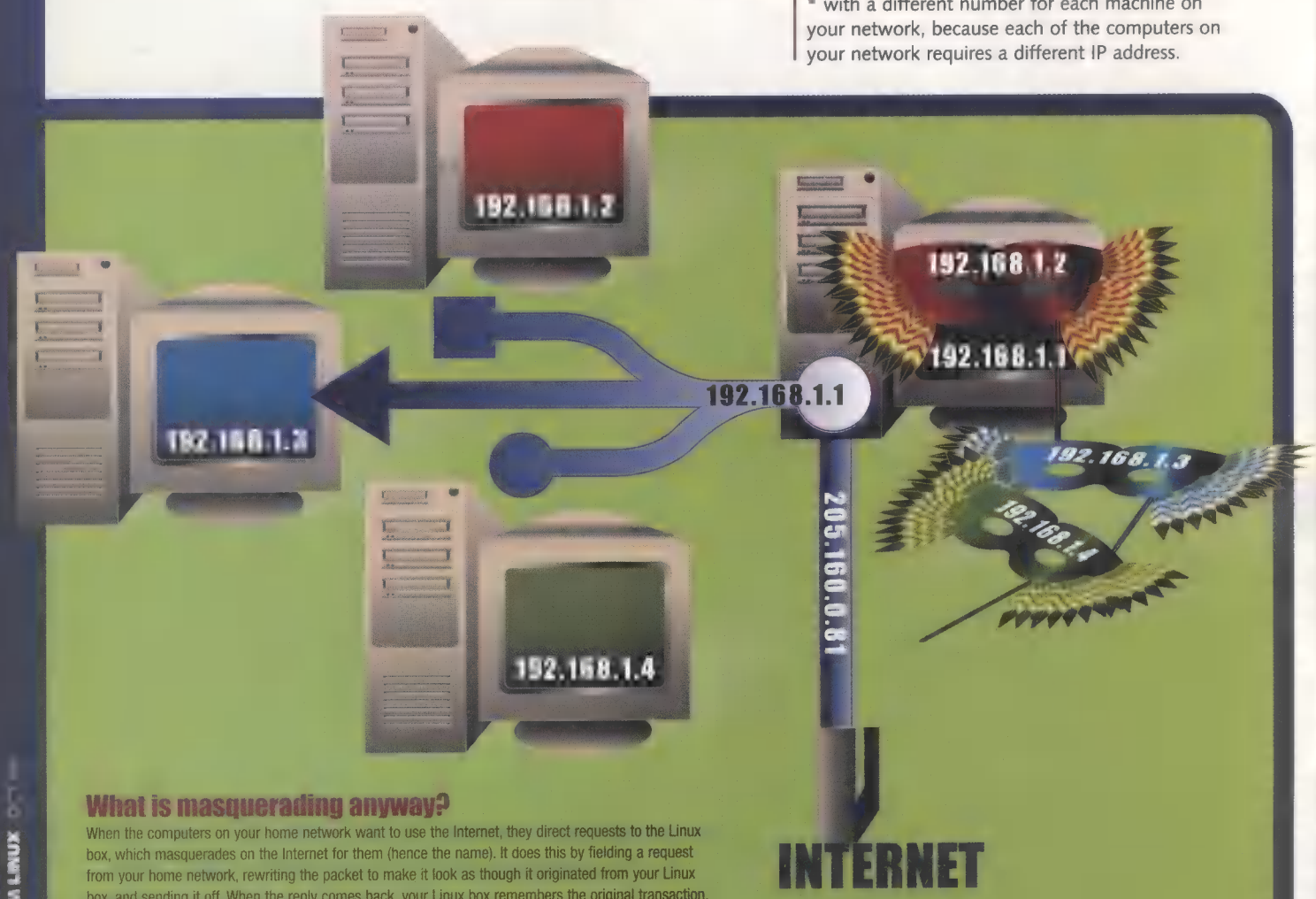
The other buttons on this screen are also worth investigating. Under the "Communications" button you'll find the script that will be executed as the login session progresses; if you have problems connecting later, come back to this area and switch on "debug connection." The "Networking" button is the doorway to some fairly slick features, including the abilities to launch PPP when your system starts and to restart PPP automatically if the line gets dropped. Set these according to your personal preferences.

When you've tweaked everything to your heart's content, click "Done," then click "Save" in the box that appears. You should now see an additional PPP interface listed in the "Interfaces" section. With the PPP line selected, click "Activate" and your modem should pick up and connect. FYI, more info on getting your PPP established can be found at **www.redhat.com/corp/support/docs/PPP-Client-Tips/PPP-Client-Tips.html**.

Most ISPs will accept the clear-text login you've just created, but some ISPs may use Password Authorization Protocol (PAP) instead. In this case, you'll need to edit the PAP area of the PPP interface editor. More information on this can be found at **www.redhat.com/mirrors/LDP/HOWTO/PPP-HOWTO-13.html**.

CONNECTING THE REST OF YOUR HOME NETWORK

Now that you have your Linux box up and running on the net, you can get the rest of your computers connected by putting them all on an Ethernet network. There are a few blocks of Internet addresses that have been set aside for "fake nets." For our purposes, we'll be using the 192.168.1.* network, where you will replace the * with a different number for each machine on your network, because each of the computers on your network requires a different IP address.



What is masquerading anyway?

When the computers on your home network want to use the Internet, they direct requests to the Linux box, which masquerades on the Internet for them (hence the name). It does this by fielding a request from your home network, rewriting the packet to make it look as though it originated from your Linux box, and sending it off. When the reply comes back, your Linux box remembers the original transaction, rewrites the packet, and sends it back to the originating computer.

Because it's nice to begin at the beginning, give the router (the Linux box) the address 192.168.1.1. Then assign a different IP address to each of your other computers, and set their gateway as the Linux box at 192.168.1.1. The netmask for all the 192.168.1.* machines, including the Linux box, will be 255.255.255.0. Configure the DNS settings on your other computers to point to a valid DNS server, such as the one your ISP gave you. Use the Network Configurator to edit the interface eth0 and give it the 192.168.1.1 IP address and the 255.255.255.0 netmask. And finally, ensure you can ping the other machines on your Ethernet by typing `ping 192.168.1.2` into a shell.

In order for Linux to "masquerade" as the other computers on the network, IP forwarding must be compiled in the Linux kernel. Red Hat gets beaucoup kudos for having already done that, so all we need to do is enter the following three lines into a shell:

```
ipchains -P forward DENY
ipchains -A forward -i ppp0 -j MASQ
echo 1 > /proc/sys/net/ipv4/ip_forward
```

ipchains is a program that manipulates the kernel's firewall and forwarding tables. You can find more information about this command at **http://metalab.unc.edu/mdw/HOWTO/IPCHAINS-HOWTO-3.html**.

THE PROOF IS IN THE BROWSING

It's time to test your new setup. Open a web browser on one of your network's computers (not the Linux router, of course). If all is well, typing in a URL will actually result in the site appearing.

What magic enables this setup to work? On your client machine—some computer on your network—you want to visit **www.linux.com**. You type that URL into the browser, and the computer looks up the site's IP address. A response—216.200.201.193—is given. Because this address does not exist on the local network, the client asks its gateway—the Linux box—to locate the IP address. The gateway rewrites the header of that packet to indicate that it originated from the ppp0 interface on the Linux box; then it sends the packet on its way to locate the IP address. A few milibleams later, a response to this request comes back to the gateway. The gateway remembers that it fielded and rewrote a client machine's request for that address, so it rewrites the packet header again, this time indicating that the packet's destination is that client machine. The packet is then sent via your home network to that client's web browser, and the page is rendered. Think of the Linux router as a Customer Service traffic cop—it fields requests and routes their responses to the proper places.

THAT THIRD OPTION WE WERE TALKING ABOUT

OR, ONE MAN'S EXPERIENCE WITH IP ROUTING

Because I'm a nice guy, I once established Internet connectivity and a campus network for a New York high school. We wanted to provide the students with filtered Internet access, but I wanted to make sure that none of the little brainiacs could hack into the academic office's server and give straight As to the entire sophomore class. With a pile of aged, repurposed computers and a few extra network cards, I implemented several segmented Ethernets throughout the school.

In each of the school's buildings, I established "privileged" and "unprivileged" LANs. The privileged LANs boasted unblocked web access and access to other privileged LANs. The unprivileged (read: for students) LANs had filtered Internet access and weren't able to transmit packets on the privileged LANs. Buildings were linked by long Ethernet runs through tunnels that connected each building's main Linux router. All interbuilding connections were TCP only, so protocols such as AppleTalk and IPX were encapsulated in TCP—or in some cases, depending on the sensitivity of the network, they were encrypted. Students, blissfully unaware of the network, could surf the net and use e-mail, while teachers could log in to an academic office server located in another building—all via an essentially public interbuilding network connection. The whole project cost around $2,000, which mostly went toward Ethernet cable and network cards.

I assigned a "fake net" (192.168.*.*) address to each Ethernet segment, and fitted out each Linux box with at least three Ethernet cards and fairly vanilla route tables. I used ssh to establish secure tunnels between the privileged LANs, and Ipxtunneld to encapsulate IPX traffic in TCP, preparing it to be sent through the tunnels to the other routers for de-encapsulation and decryption. I used *netatalk*, an AppleTalk fileserver for Linux, to route AppleTalk. I used UAR, a Unix AppleTalk router, to encapsulate AppleTalk packets within IP. At one point, I even had a UAR node at my house so I could browse the internal school network from home in native AppleTalk.

If you're feeling cheeky enough to build an IP-routed subnet in the comfort of your own home, you're going to need to call that good techie friend of yours who works at your ISP and ask for a few static IP addresses that sit nicely on a subnet boundary. You'll also need to get real Internet addresses for each machine on your home network. With this setup, you'll be able to connect directly from anywhere in the world to any of your home machines, providing you with unrestricted access to any of your home network's drives from anywhere in the world. In your quest to rule the world, that can come in very handy. Take it from me—Mr. Nice Guy.

Troubleshooting Tips

What if all your configuring results in absolutely nothing? Check the following:

- Be sure you can reach your Linux box over the network. Do a ping to the gateway's IP address and make sure you get responses. If not, the problem lies in the setup of your home network.
- Try deleting and reinstalling your eth0 interface from within the netcfg tool, and check the IP setup's on all of your network's computers.
- Be sure you can ping the web site you're trying to reach. If that fails, check your PPP setup; if it's working properly, check out the masquerading section of http://metalab.unc.edu/mdw/HOWTO/IPCHAINS-HOWTO-3.html.

For other web links, be sure to check out the Linux Resource Central on page 60.

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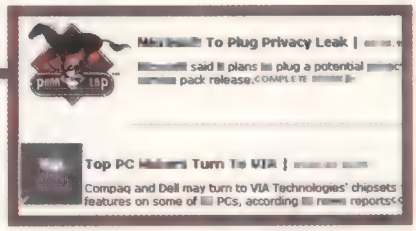
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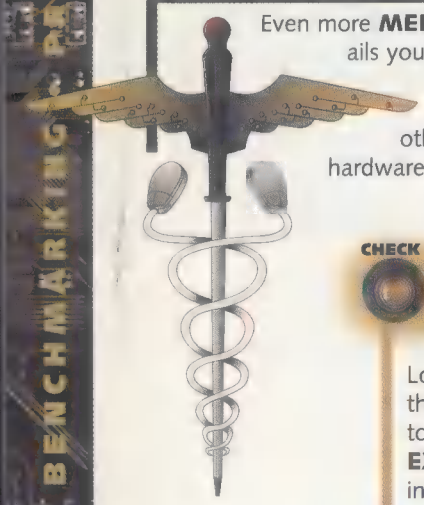

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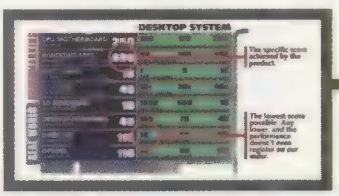

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REBUILDING THE Linux Kernel

Ever performed brain surgery?

The kernel is the brain of the Linux operating system—handling input and output, memory management, and process scheduling—but unlike most OSes, Linux's kernel can be fine-tuned and optimized by anyone

"But the kernel I have is running just fine!" you say. Baby, *Maximum Linux* isn't about running "just fine"—it's about pushing the envelope and getting bigger and badder performance out of your box. By recompiling your kernel, you'll experience faster boot ups and snappier responses at the command line and in native applications. So scrub up, Doc—using the following tips and tricks, we're gonna perform some maneuvers that'll make your kernel come alive.

BY JARED ARMSTRONG

Why hack it?

The stock kernel that shipped with your distribution of Linux (Red Hat, Debian, Slackware, etc.) is probably a compromise at best. It was compiled for you ahead of time by distribution packagers whose goal was to get you up and running with as little trouble as possible. As such, it contains drivers and support for dozens of network cards, serial cards, hard drive interfaces, soundcards, and other common peripherals.

Our goal is to fine-tune your kernel, to compile in it only the things needed for your particular system—to support your specific hardware or multiprocessor motherboard, or to meet your specific needs for a dedicated DNS server. Your reasons for tweaking the kernel may vary, but the procedure for doing so is the same regardless.

But before we delve too deeply into this process, remember: Tweaking the kernel is not a task for the faint at heart or something you should try out on mission-critical equipment. Before doing anything, backup everything—and we mean *everything*. You've been warned.

Before we begin...

We're assuming you've already installed Linux and the GNU C compiler, and know how to move around in directories, copy and move files, make symbolic links, and use a plain text editor like *vi*. For the larger, modern kernels, you'll also need LILO version 19 or higher. But since most distributions now ship with version 21, chances are you'll be OK. You'll also need to have root access on your box, about 200MB of free hard drive space, and as much memory as you can stuff into your machine. Our demonstration box is running a 450MHz K6-2 with 1MB cache and 128MB of RAM, Red Hat version 6.0, *GIMP*, and *Blender*. The kernel version is 2.2.5-15.

Decisions, decisions

The first thing you should consider is whether to recompile your current kernel or to grab a newer one. There's little general guidance we can provide you here, but keep in mind that kernels are numbered in a strange way: The first number is the release number, the second number is the version number, and the last number is a patch level, where minor improvements have been made. We recommend that you stay with release 2 and even-numbered versions (odd-numbered versions are developmental and possibly more unstable). Get the highest even-numbered kernel version you can, and use developmental kernels only if you have a new piece of hardware that is not supported by a stable release. At press time, the latest stable kernel is 2.2.10.

Installation time

Now install the kernel source on your working Linux box. If you've decided to pick up a new kernel, you can find one at one of the locations shown in the Linux Resource Central (page 60) or at your favorite distribution site. If you installed Linux from a distribution CD, the source packages should be included with it. If you're using Red Hat, you can use the kernel-source and kernel-headers rpms and install those. For other distributions, unpack your .tgz or .tar.gz files into /usr/src/linux-x.xx.x, where x.xx.x is your kernel release number. Next, make a symbolic link from /usr/src/linux to /usr/src/linux-x.xx.x.

A PATCHWORK ORANGE

Perhaps you're wondering why we've opted not to discuss the process of patching the kernel source. Frankly, we've experienced fewer headaches downloading the complete source, rather than downloading numerous patches to bring a kernel up to date. The patching concept harkens from a time when a 14.4Kbps modem was hot stuff and kernels took hours to download from overloaded sites. In this era of ISDN, cable modems, and mirror sites, wasting your time patching the kernel is just silly.

Making whoopie

Now that your source is in place, be sure you are in /usr/src/linux, and type either `make config`, `make menuconfig`, or `make xconfig`. The first option will yield a set of questions posed one line at a time; the second will result in a curses console-based GUI. The third option is an X-based GUI, and must be started from within the X Window System. We'll use `make xconfig` for this demo.

The kernel xconfig menu is shown in **Figure 1**. As you can see, the different areas of kernel support are shown, and you

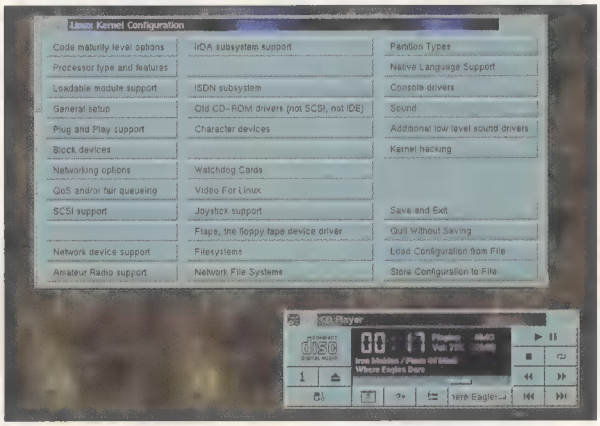


Figure 1

can click on the boxes to access them. We'll take you through some of the major choices you need to make, but remember: Each computer is unique, so it's up to you to decide what gets included and what doesn't.

You will notice in **Figure 2** that some kernel support items are marked Y, M, or N. Choosing Y indicates, "Yes, include this in the kernel." Choosing N indicates, "No, don't include it in the kernel." M stands for modular, meaning that support is compiled into the kernel, but that the actual software for talking to the device is compiled into a separate module. There are different schools of thought on this, but the overarching principle is: If you don't use a device often, don't keep the software for that device in memory all the time. Instead, a module can be loaded when the kernel is asked to perform a task requiring the particular device. Kernels that are compiled to use modules are known as modular kernels. Kernels that are compiled with all software built in are known as monolithic kernels. With some experimenting, you'll develop a good sense of whether or not to include software in the kernel or to compile it in a module.

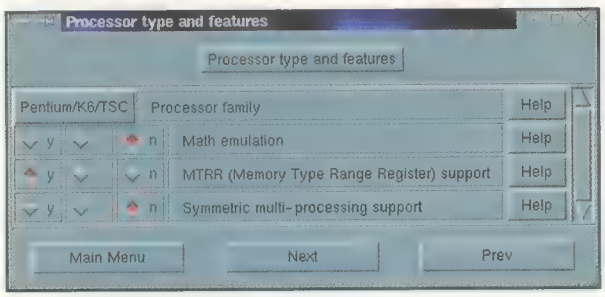


Figure 2

Let's begin by examining the kernel's most important sections and considering how best to cut down the kernel's size and get it optimized for your system. First, turn off the prompt for development and incomplete code/drivers, under the "Code Maturity Level" options. This will hide prompting for experimental or unstable kernel drivers during our configuration. Next, under "Processor type and features," choose your processor. As you can see, the default is set to compile for a 386; if you have a better processor, choose it so the compiler will make use of your processor's advanced features and create leaner code.

Other important considerations concern the "Network Device Support" and "Block Devices" sections. A number of network cards and file systems are presented to you here, but most people have only one network card, so you can turn off all the rest. Be sure to enable PPP or SLIP if you use them to dial your ISP, and enable support for the ISO9660 file system if you use a CD-ROM.

TIP 1

If you have an AMD-based processor, choose the Pentium or Pentium Pro option. If you have a Cyrix-based processor, check the net for details on other users' experiences and for helpful advice.

TIP 2

Turn off math emulation if you have a processor more advanced than a 386 SX. The rule is, if you don't need it, don't stick it in the kernel. If you're not sure you need it, go with the default. You can always hit the "help" button if you're using "xconfig" and aren't entirely sure what a driver does.

TIP 3

Build the code for network and file system support into the kernel. If you don't, and for some reason the module gets thrashed, you'll lose your network and file system support. This is not a good thing. SCSI users should build the kernel with SCSI support set to "Y". This eliminates the need for a RAM disk to get SCSI going at start-up. You may also want to build sound support into the kernel as well.

You can probably disable the lion's share of the options listed under the "Character Devices" section (**see Figure 3**). You can also eliminate all but the languages you will actually be using in the "Native Language Support" section. In "Networking Options," remove protocols such as AppleTalk and IPX unless you plan to talk to really old Macintosh networks or Netware servers that don't speak TCP/IP. You can also enable such things as routing and firewalling, if you need them.

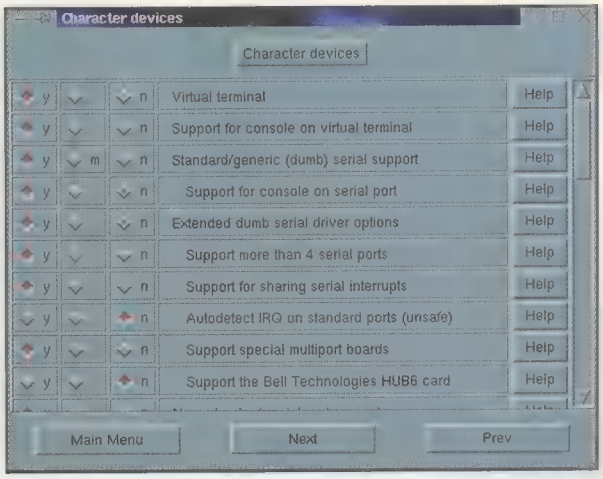


Figure 3

When you've finished choosing the support you want for your kernel, exit your config program and save changes. You will then have a kernel configuration file located in /usr/src/linux/.config. Poke around in it if you like, with *vi* or your favorite text editor. If you see anything you didn't intend to be in the kernel, go back and reconfigure, or edit the file directly if you like to live dangerously.

Compiling the kernel

Now, from the /usr/src/linux directory, type `make dep`. On the next line, type `make clean`. Or, if you choose, you can put both commands on the same line by typing `make dep; make clean`. These commands will prepare the kernel source for compiling and will take a few minutes. You'll see a flurry of "compiler" and "make" messages like those shown in **Figure 4**. If a problem arises, make will let you know.

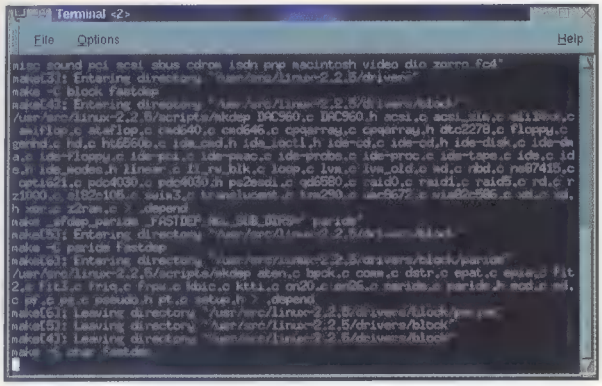


Figure 4

The next step is to compile the new kernel. At the command prompt, type `make bzImage`. This compiles the kernel source, which can take from several minutes to several hours, depending on the kernel size and the speed of your system.

TIP 4

You may also see documentation that tells you to use the commands `make bzlilo`, `make zlilo`, or `make zImage` to compile the kernel. The `make zImage` option allows you to create a large kernel that can be loaded from your hard drive; the others are for creating older, smaller kernels or kernels that boot from a diskette. If you need a kernel that can be compiled from a diskette, consult the kernel-howto and the bootdisk-howto, or one of the other sources listed in the Linux Resource Central on page 60.

If everything goes as it should, you should now have a new kernel, called bzImage, located in the directory called /usr/src/linux/arch/i386/boot. Copy this kernel to the /boot directory. Then tell LILO, the Linux loader, how to boot up: Go to your /etc directory and open lilo.conf, using your text editor of choice. Create a new image section for your new kernel. You can follow the format of your existing section—just change the name of your new section's image to /boot/bzImage and change the label of your old section to linux-old. You should now see something that looks like **Figure 5**. If you use Windows as a boot option, you'll see a listing for it as well.

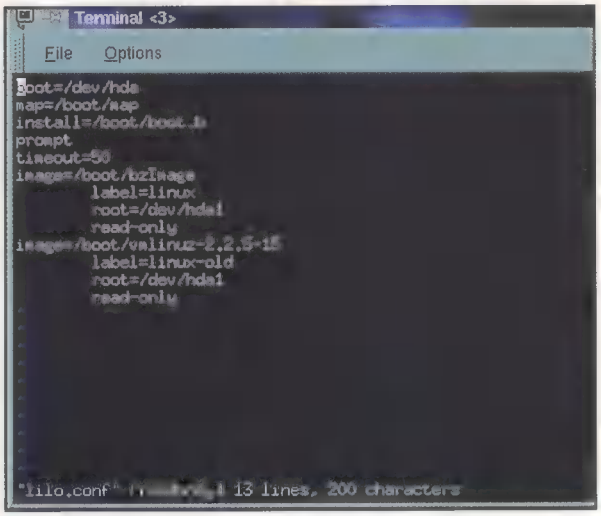


Figure 5

Exit your text editor and tell LILO about your new configuration by typing `/sbin/lilo` from the prompt. LILO will then read your new configuration.

You're almost done!

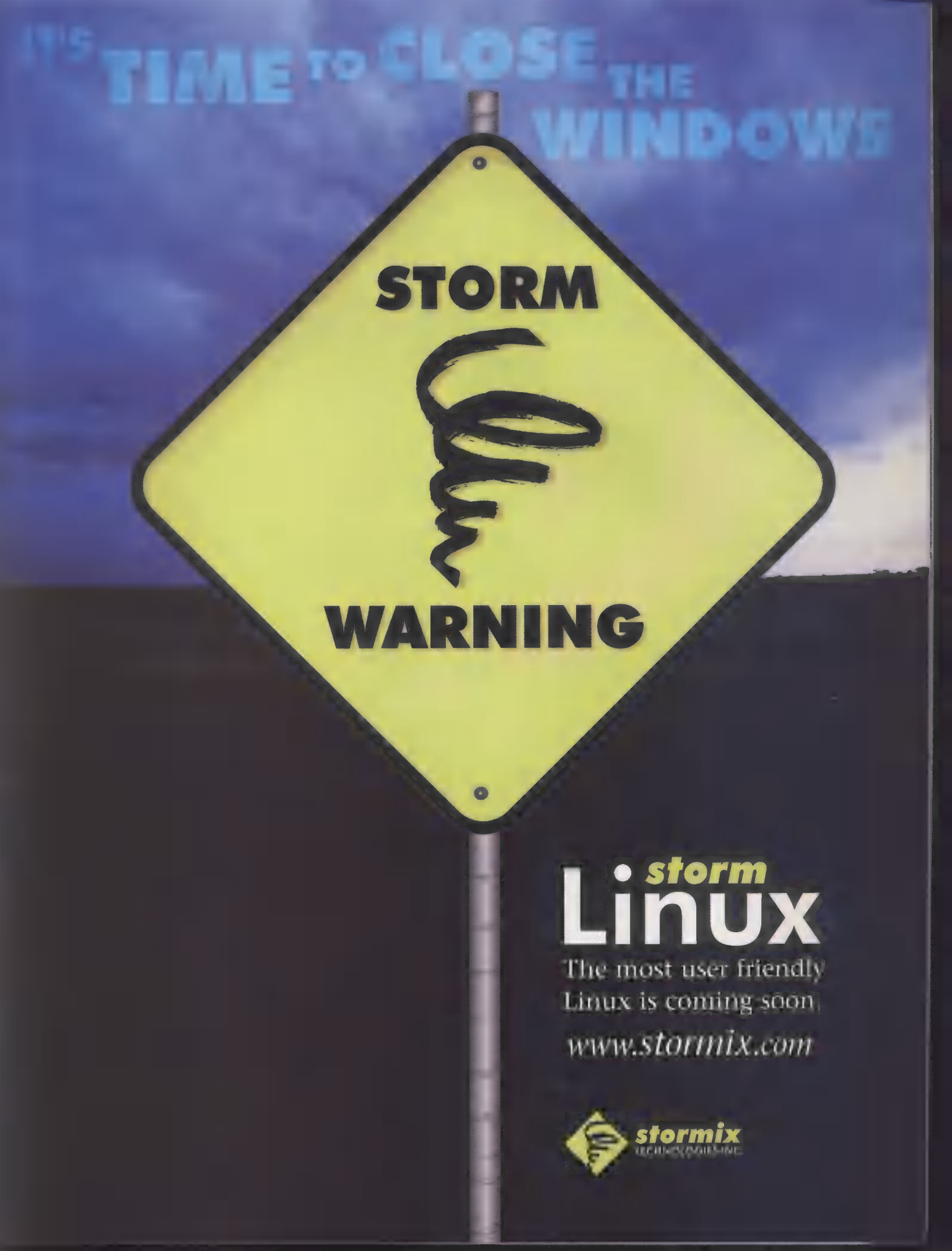
You now need to compile the software for the modules you want the kernel to use. Go to /lib/modules and move the current directory (which should be called 2.2.5, or something similar) to a file named 2.2.5-old. Return to /usr/src/linux and type `make modules`, then `make modules_install`. These commands will build your modules and install them in something like /lib/modules/2.2.xx-xx, where the x's will depend upon the exact kernel you built. Go into your new modules directory and type `depmod -a`, which will create a list of the module dependencies, indicating to the kernel the order in which it should load the modules when they are needed. A new file called modules.dep should now be visible in your new directory.

Time to reboot! Do a `shutdown -r now` command after kicking off any users on your box. At the LILO prompt, hit tab and you will see that you now have two options for booting Linux: your old kernel or your new one. By default, LILO will load the first image section it reads from the file. Since you hit tab, you will have to manually enter the name of the image you want to load. Type `linux` (or whatever label you put on your new kernel in lilo.conf). Your new kernel will now load. Keep an eye out for any error messages or load failures; you may need to rebuild your kernel to include support for something you left out that the OS needs. If something goes terribly wrong and you can't even boot with your new kernel, reboot or power down and enter in the name of your old kernel when prompted.

Run the kernel for a while to make sure everything is OK. Start X, ping another computer, or run a few games. If you see any error messages such as "serial support not enabled in kernel," go back and compile that in. Only when your new kernel is everything you want it to be can you delete your old one.

Happy hacking!

Questions or comments? e-mail us at **editor@maximumlinuxmag.com**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The Distribution Dilemma

FOUR MAJOR LINUX DISTRIBUTIONS RIPPED APART, REVIEWED, AND RATED.

BY CHRIS DUNPHY

You know you want a piece of the action, but before you head off to your local strip mall to get some Linux lovin', you're suddenly hit with a serious dilemma. Is it worth parting ways with a few Andrew Jacksons to do the deed, or should you just jump on the web and download it for free? It's a decision made tougher by the overwhelming number of choices before you. Red Hat, Slackware, Caldera, SuSE, Debian...the full list of Linux distributions is longer than the daily roll call at the Mustang Ranch.

Free is nice, but if you're new to Linux or to PCs in general, you'll probably want to take home one of the commercial distributions. They generally come with oversized packages, including detailed manuals and other bundled goodies. And unless you like wandering around alone in the dark, you'll likely appreciate the technical helping hands you get when you go commercial. Oh sure, you'll make it home with a freebie, but with a distro, you'll get there without the bruises.

You're discombobulated by the distribution dilemma, but rest assured—we have the satisfaction you seek.

WHAT'S A DISTRIBUTION ANYWAY?

There's just one Windows 98, only one BeOS, and you can only get OS/2 (remember that?) from IBM. But it seems as though everyone is hawking their own brand of Linux—no "one true Linux" has emerged.

That the Linux community bears up under this all these distributions is testimony to the strength of the open source concept. From its beginning, Linux was developed and distributed under the terms of the GNU General Public License (GPL), which explicitly allows free and unlimited copying and modification of all GPL'ed software. But there's a catch—any software based upon or derived from something released under the GPL must also be released with the same terms attached. Once free, always free.

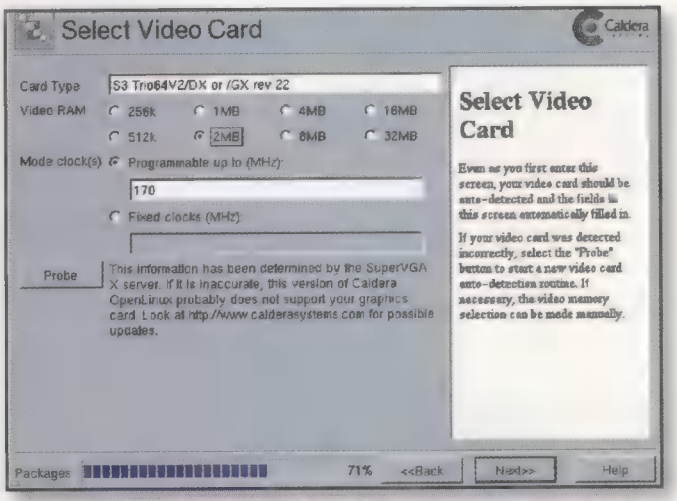
Thanks to this policy, every new Linux user is also a potential Linux developer. If you find and fix a bug, your fix becomes part of Linux posterity. But with so many users around the world contributing new pieces to Linux on a daily basis, it's impossible for any one person to keep up with it all. That's where "distributions" come into play. Each distribution attempts to take a snapshot of the ever-evolving mass of code that is Linux, and to package it up in a debugged, tweaked, well-documented, and easy-to-install whole.

Each distribution has its own flavor and personality. The challenge is to find the one that fits you best. The Linux world is a world of choices, and with a little work you can find a distribution and build a system that fits like a glove. It may make things a bit confusing at first, but it sure beats the "one size fits all" attitude of the Windows world.

Caldera OpenLinux 2.2

THE BEST INSTALLER. PERIOD.

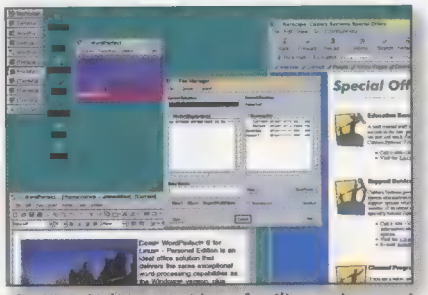
Caldera OpenLinux 2.2 is missing many of the features that, in the past, defined the Linux experience: clunky installation and configuration processes, poor Windows integration, and confusing documentation. And unless you're a glutton for punishment, you're not gonna miss them.


Select Video Card
Caldera
Card Type
S3 Trio64V2/DX or /GX rev 22
Video RAM
256k
512k
1MB
2MB
4MB
8MB
16MB
32MB
Mode clock(s)
Programmable up to (MHz):
170
Fixed clocks (MHz):
Probe
This information has been determined by the SuperVGA X server. If it is inaccurate, this version of Caldera OpenLinux probably does not support your graphics card. Look at http://www.calderasystems.com for possible updates.
Select Video Card
Even as you first enter this screen, your video card should be auto-detected and the fields in this screen automatically filled in.
If your video card was detected incorrectly, select the "Probe" button to start a new video card auto-detection routine. If necessary, the video memory selection can be made manually.
Packages
71%
<<Back
Next>>
Help

Caldera's Lizard installation tool lets you configure accounts and even play Tetris while you wait for the OS to install in the background.

OpenLinux makes the refreshing assumption that you already have Windows installed on your system. Caldera includes *BootMagic* boot manager, a much better tool for setting up a dual-boot system than LILO, along with a special limited edition of the nondestructive repartitioning tool *PartitionMagic*, which allows you to take Linux for a spin without trashing your hard drive. Though *PartitionMagic*'s options will make you feel a little like Goldilocks—the 300MB partition is too small, the 1GB partition is a little tight, and the max-sized option leaves only 100MB of free space in Windows—it sure beats the alternative of erasing your drive and reinstalling Windows.

The magic begins the moment you're ready to install. Booting off the provided floppy or CD instantly presents you with Caldera's graphical Lizard (LInux wiZARD) interface, rather than the traditional stream of cryptic text. This graphical, mouse-driven installation tool is a beaut, making other distributions' text-based installation interfaces seem archaic.



The KDE desktop provides a familiar environment for new Linux converts.

Lizard asks you a few basic questions and begins installing software in the background while you finagle with the graphics and networking setups. By the time you're through with the configuration prompts, Lizard may even have finished its full install. If not, it sets you up with a *Tetris* game to kill time while you wait. We've never seen an installation routine this cool on *any* platform.

Once you've finished the installation and logged in, you'll find the slick KDE desktop environment pre-configured and waiting for you. KDE can emulate the look and behavior of Windows, BeOS, or even the MacOS, if you're into that sort of thing. OpenLinux's default menus are designed to allow easy access to most of the bundled apps, so it's a breeze to access your CD and floppy.

The OpenLinux documentation, which includes a clear, concise manual and a handy quick-reference card, is among the best in this roundup in terms of aesthetics, but it's lacking the sheer depth and quantity of the docs provided by a distribution such as SuSE. In spite of this, the only really glaring omission is coverage of how to configure the sound setup.

Caldera provides 90 days of support, but only via e-mail; its online support area, however, is better than average. And though the OpenLinux bundle includes *Star Office 5*, *Word Perfect 8*, and the full *BRU* personal backup utility, SuSE's deluxe La-Z-Boy–sized package of apps makes Caldera's single binary CD look like a leaky beanbag.

MiniMe-sized bundle aside, OpenLinux is in a league of its own when it comes to ease of installation. Caldera and its kick-ass Lizard have raised the bar not just in the Linux world, but everywhere.

PLUSES
Kick-Ass installer
PartitionMagic & [illegible]
Excellent [illegible]
[illegible]

MINUSES
[illegible]

MAXIMUM LINUX VERDICT

Price $40
Company Caldera Systems
Phone 888.465.4689
URL www.calderasystems.com

9

SuSE Linux 6.1

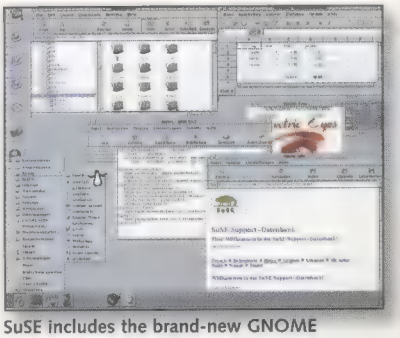
GERMAN GIGANTOR

German software giant SuSE cranks out one of Europe's leading Linux distributions, and with SuSE Linux 6.1, it hopes to carry its success across the pond to the land of apple pie and Budweiser. But, as you might expect from an approaching would-be conqueror, SuSE Linux is big (five CDs big), powerful, and not especially friendly.

SuSE Linux gives you more apps to play with than most commercial Linux distributions.

SuSE provides no support for hard drive repartitioning other than *FIPS*, an extremely limited freeware utility. Adding insult to injury, SuSE actually recommends that you "buy a new drive" in preparation for installation. Unless you've got Benjamins to burn, that's not a realistic option for most.

The SuSE installation is managed by the text-based *YaST* tool, which pretty much blows when compared to the clever hardware auto-detection of Red Hat, or the sheer graphical elegance of Caldera. There's also a serious online help abyss—we were often left guessing what to do next. A novice Linux user could quickly feel as though they'd been set adrift in shark-infested waters seated in a dinghy made of raw meat.



SuSE includes the brand-new GNOME desktop, seen here.

SuSE's actual installation process is exceedingly long and tedious, particularly if you choose to install "almost everything" from the five CDs. You're actually better off starting with a basic installation—you can always load more pieces later—because the Biblically proportioned time it takes to install "almost everything" is made doubly annoying by the lack of a "time-remaining" readout.

If you make it through the install, the reward for your patience is software galore. SuSE Linux is by far the largest commercial distribution of Linux available; it provides well over 1000 packages for your experimental pleasure. And the SuSE philosophy is to dish up as many options as possible, so you can spend quality time checking out both the GNOME and KDE desktop environments, *Star Office 5* and *WordPerfect 8*, and plenty of window managers and graphical goodies. It seems as though every programming tool ever invented is also included, along with a slew of classic system emulators ranging from Amiga to Atari 2600 to the new color Gameboy. *Super Mario Brothers*, anyone?

SuSE provides 60 days of installation support primarily through e-mail. They do offer free phone support, but only on Mondays and Thursdays between 11AM and 6PM PST (we are not kidding about this). The built-in help system is a bit awkward to use—when you push the help button on the default KDE desktop, the first screen that pops up is actually written in German (we're not kidding about this, either). Though the online support area is fairly comprehensive, several help documents have yet to be translated into English.

The SuSE manual is huge, covering a broader range of topics in more depth than the documentation provided with any of the other distributions reviewed here. Unfortunately, it covers so much that new users will undoubtedly be confused. The manual also suffers from "interpretive" troubles, with some awkward translations from the Deutsche to the English make it a bit tough to read.

If you fancy yourself a Linux guru—or if you were a German major—SuSE will provide the traditional Linux experience, complete with a tricky configuration and tons of apps. And once you've mastered SuSE, you can legitimately consider yourself a Linux *wunderkind*. But if you want a minimal learning curve, *meine liebling*, look elsewhere.

MAXIMUM LINUX VERDICT

Price $50
Company SuSE, Inc.
Phone 888.875.4689
URL www.suse.com

6

DEBIAN LINUX: THE LAND OF THE FREE

Nothing embodies the true spirit of Linux better than Debian. Funded entirely by donations and worked on by more than 300 active volunteers, the Debian Linux distribution rivals even the best commercial Linux flavors. Thanks to this army of volunteers, Debian has emerged the largest Linux distribution out there, with more than 2,250 software packages included at last count. There is enough included in a full Debian install to keep a Linux hacker busy ad infinitum.

Every Debian user is invited to join in Debian's open development process. Bugs are tracked in a public database, code is made available, and all decisions are discussed in public forums before being voted on by the developers. If you've ever felt a desire to make your mark on the future of Linux, Debian is the place to start.

However, there are some downsides to this global development model. Debian is trickier to install than other Linux distributions, and its major revisions occur less frequently. The overall end-user experience is a lot less polished, and Debian isn't recommended for Linux first timers.

One area in which Debian pleasantly surprises is its support offerings. Without a commercial organization behind it, Debian offers no phone numbers to call for help, nor any guarantee of assistance via e-mail. But the Debian IRC channel and various mailing lists are fonts of information, and other users will often answer questions in just minutes.

The newest release of Debian (2.2, a.k.a. "potato") wasn't ready in time for this review, but should be out by the time you read this.

PLUSES

MINUSES

LINUX SYSTEM REQUIREMENTS

Linux has been ported to everything from the Palm Pilot to the world's largest mega-computers, so no matter how your rig is config'd, you can probably get Linux up on it. An old 486 can find new life as an Internet gateway for your home network, and an obsolete Pentium can be turned into a killer file server. But if you want to build a truly useful Linux workstation, keep these hardware guidelines in mind:

CPU: Pentium-class or better; dual and quad CPU configurations supported

RAM: Minimum 32MB for a usable GUI, 64MB preferred

HD Controller: Most SCSI and all IDE controllers supported

HD Space: Dedicated partition required; allow at least 500MB, 1GB preferred

CD-ROM: Any ATAPI or SCSI; a bootable CD-ROM eases installation

Graphics: Most older graphics chips are now supported, but drivers are yet unreleased for many "new" chips. Check with www.xfree86.org for the latest list. As a last resort, you can always run in a low-res basic VGA mode.

Modem: External and most internal modems are supported. WinModems, the name implies, are not compatible.

Network: Most popular Ethernet cards work under Linux.

Sound: All popular ISA soundcards work under Linux. Only a few PCI soundcards are currently supported.

If your system includes nothing particularly unusual, odds are good that you'll be able to install Linux without any trouble. To play it safe, though, it's a good idea to check the latest hardware compatibility list on the home page of the distribution you're planning to install. Doing due diligence in advance can avoid some pain later.

Red Hat 6.0

FAN FAVORITE FALTERS

Red Hat Software has done more than any other company to push Linux into the mainstream; its Red Hat distribution of the OS is currently one of most popular packages around. But it seems as though being on top has gone to Red Hat's... um, hat.

With the release of Red Hat 6.0, the company jacked the price to roughly twice that of the competition. Had twice as much dough garnered twice as much content, the $80 price tag wouldn't have bothered us.

Red Hat is the most popular Linux distribution around.

Let's just say we were bothered.

Red Hat 6.0 falls far short of Caldera in the ease of installation category and slumps before SuSE's sheer volume of included applications. The text-based Red Hat 6.0 installation routine is clear, well-documented, and easy to get through, but compared to Caldera's installation, it's in the bush leagues. And only the meager *FIPS* utility is provided to help you create space on your drive for a Linux partition; at the price Red Hat is charging, it's criminal that they didn't include a better tool.

The Red Hat Package Manager gives you total control over what is installed on your system.

Red Hat's greatest contribution to the Linux community has been the Red Hat Package Manager (RPM), an awesome accessory that keeps track of the software installed on your system. RPM lets you search for new versions of software, takes dependencies into account, and painlessly performs installations, removals, and upgrades.

Presumably so users can feel they've put RPM to good use, Red Hat 6.0 comes bundled with the "Linux Application CD" which, if you believe the packaging, contains "over $1000 worth of software." Riiiiiight. A perusal of the CD reveals a wealth of stock development-related tools, nearly all of which are limited demo versions or available free on the net. We'll give them one gold star for including *Star Office 5* and IBM's *ViaVoice* dictation software.

Red Hat 6.0 includes fairly solid documentation that's broken down into two parts: A Getting Started Guide explains how to use and configure the default GNOME desktop (KDE is also provided), and an Installation Guide details the installation procedure, basic system administration and configuration, and how to use RPM. The online support is the best in this roundup, offering easily accessible Linux information. Once you've registered for your 90 days of installation support (and 30 days of phone support), you can log in and track the progress of problems you've already opened.

In spite of its outrageous price tag, Red Hat 6.0 sits somewhere in between the sheer elegance and ease of Caldera and the cornucopia of software that is SuSE. Red Hat's biggest flaw is its contention that it's an ultra-stylish red Fedora, when it's really more of a Red Sox cap.

PLUSES

Good documentation

Relatively easy to install

MINUSES

High price

Not the most in terms of

MAXIMUM LINUX VERDICT

Price $80
Company Red Hat Software
Phone 888.733.4281
URL www.redhat.com

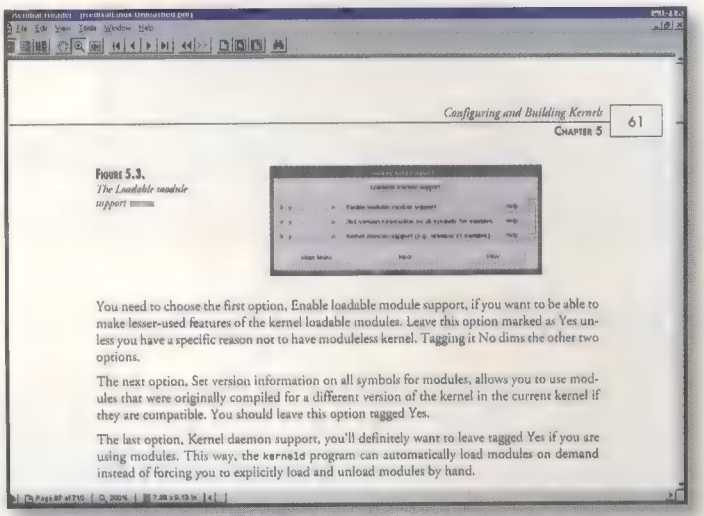
7

Deluxe Linux OS 6.0

A REPACKAGING OF A REPACKAGING

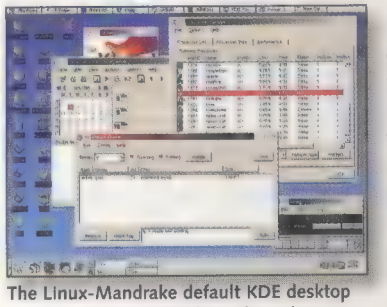
Macmillan's Deluxe Linux 6.0 is a strange hybrid. It's a repackaged version of Linux-Mandrake 6.0, which in turn is an optimized and tweaked version of Red Hat 6.0. Despite its confusing lineage, this odd distribution very nearly grabs an editor's-choice award for being such an awesome value.

Linux-Mandrake is a highly regarded French distribution that aims to be a better Red Hat than Red Hat. Starting with a generic Red Hat 6.0 configuration, MandrakeSoft has recompiled the kernel with Pentium optimizations, updated a few packages, and added a bevy of its own user interface tweaks designed to make the end-user KDE experience more pleasant.


Configuring and Building Kernels
CHAPTER 5
61
FIGURE 5.3.
The Loadable module support
You need to choose the first option. Enable loadable module support, if you want to be able to make lesser-used features of the kernel loadable modules. Leave this option marked as Yes unless you have a specific reason not to have moduleless kernel. Tagging it No dims the other two options.
The next option, Set version information on all symbols for modules, allows you to use modules that were originally compiled for a different version of the kernel in the current kernel if they are compatible. You should leave this option tagged Yes.
The last option, Kernel daemon support, you'll definitely want to leave tagged Yes if you are using modules. This way, the kernel program can automatically load modules on demand instead of forcing you to explicitly load and unload modules by hand.

The electronic books bundled with Deluxe Linux suffer from low-res screen shots.

Add Macmillan's contribution of an extra CD that features *BootMagic*, a special edition of *PartitionMagic*, and three electronic books with more than 2000 pages of documentation, and you've got something worth checking out. Throw in the fact that this "complete" Linux costs just $30, and you have something you'd be crazy not to grab. For $20 more, you can get the "deluxe" version that includes a copy of *Star Office 5.1* and an edition of *PartitionMagic* that's nearly identical to that bundled with Caldera's OpenLinux. However the Macmillan version offers more reasonable partition size choices of 600MB, 1.5GB, and max.



The Linux-Mandrake default KDE desktop is pre-configured with lots of goodies.

The installation procedure for Linux-Mandrake essentially mirrors Red Hat's in form and ease of use—it's decent, but not the best. The included install documentation is not nearly as complete as the docs that ship with Red Hat 6.0, but if you run into trouble, the full Red Hat manual is included on the CD.

The electronic books—*Red Hat Linux Unleashed*, *Using Linux*, and *Sam's Teach Yourself Linux in 24 Hours*—are actually PDF files that can be read with Adobe *Acrobat*. Unfortunately, Macmillan didn't put much effort into ensuring that the books are actually useful. You could print out all 2000 pages, killing more than a few trees, but Macmillan should have done its part to save the environment and included hyperlinks to make electronic navigation within the books easier—not even the table of contents is hyperlinked. And because the screen shots used in the books are stored at low resolutions, it can be difficult to read the accompanying samples. Also, most of the "Macmillan extras" CD has been left blank; alas, Macmillan did not take advantage of this space by providing a larger bundle of Linux apps.

Linux-Mandrake's accompanying documentation is bewildering at best; the poorly translated Linux-Mandrake manuals contain instructions that actually conflict with Macmillan's own "Getting Started Guide." A red "warning" sheet tells you to ignore the instructions in the Mandrake manuals, advising you not to attempt to get support through MandrakeSoft or Red Hat. Instead, you're pointed to a web site where Macmillan has contracted out for unlimited e-mail installation support. If you think this sounds confusing, you're right.

Deluxe Linux includes a good partitioning tool, and does much to improve upon the overall Red Hat user experience. But the disjointed, thrown-together feel of the overall package sours what is otherwise an incredible value for a Linux novice.

PLUSES

- [illegible] value
- PartitionMagic and BootMagic included

MINUSES

MAXIMUM LINUX VERDICT

Price Deluxe Linux $50/Complete Linux $30
Company Macmillan Software
Phone 800.858.7674
URL www.macmillansoftware.com

8

DISTRIBUTION DILUTION

There appear to be as many "distributions" of Linux as there are Linux hackers in the world, and thanks to the GPL, any Joe on the street can take Red Hat, modify it a bit, and re-release it as *Joe's Yellow Jacket Linux.*

The sign of a quality distribution, however, is one that's backed by a dedicated group of people who are committed to stability testing, performance tuning, and bug fixing. Don't trust your machine to any no-name distribution that hasn't earned itself a solid reputation.

Here's a quick rundown of some other reputable Linux distributions that you may wish to check out.

Slackware Linux Slackware is one of the oldest Linux distributions that's still actively maintained. Its aim has always been to provide the most "Unix-like" experience. Some power users swear by Slackware, but it's widely considered to be one of the hardest distributions to install. *www.slackware.com*

Stampede GNU/Linux The Stampede team is focused on creating a Linux distribution optimized for speedy performance on the latest Pentium-class CPUs. This is definitely not the Linux you want to use on that old 486. Stampede is a relative newcomer, but it seems to be maturing rapidly. *www.stampede.org*

Storm Linux The most recent Linux distribution is Storm Linux from Stormix Technologies. Based upon Debian, Stormix's goal is to make Linux easier to install than ▶

DISTRIBUTION (CONT FROM P.56)

Windows. Storm Linux is currently in public alpha-test, but the 1.0 release is due this fall. *www.stormix.com*

TurboLinux TurboLinux has focused on the corporate and Asian marketplaces with great success, recently outselling the Windows 98 upgrade in Japan. If you need native Chinese and Japanese language support, nothing beats TurboLinux. *www.turbolinux.com*

It's wise to purchase an "official" Linux distribution, particularly if you're new to Linux and can benefit from the printed documentation and installation tech support. But if you'd like to try out several Linux configurations on the cheap, nothing beats shovel-ware. Shovel-ware vendors such as InfoMagic (*www.infomagic.com*) and LinuxMall (*www.linuxmall.com*) sell "unofficial" copies of the name-brand distributions, with no support, no extras, no bundled software, and no printed documentation. A six CD set from Info Magic, featuring Red Hat 6, Slackware 4, SuSE 6.1, and Caldera 2.2, costs just $27.50. LinuxMall sells single copies of most distributions for a mere $2. Or you can buy the Linux MegaPak-XL, featuring nine different distributions and a Penguin Power t-shirt, for just $28.

You can't beat these deals if you know what you're doing, but if you're a Linux newbie, you may end up feeling as though you've dropped $30 on a set of coasters. And even the shovel-ware vendors agree that it's a good idea to support the companies that make Linux possible by purchasing an "official" version once you've found the distribution you like best.

Dare to Compare

THE FOUR COMMERCIAL DISTRIBUTIONS COMPARED

As we said previously, it's up to you to decide which distribution best fits your needs. But to help you make that decision, we've broken down our four reviews into this handy comparison chart.

DARE TO COMPARE

	CALDERA OPENLINUX 2.2	SUSE LINUX 6.1	RED HAT LINUX 6.0	MACMILLAN DLX LINUX 6.0
Kernel Version	2.2.5	2.2.7	2.2.5	2.2.9
Desktop Environment	KDE	GNOME, KDE (Default)	GNOME (Default), KDE	KDE, GNOME
Partition Tool	PartitionMagic (Caldera Edition), FIPS	FIPS	FIPS	PartitionMagic (Macmillan Edition), FIPS
Boot Manager	Boot Magic, LILO	LILO	LILO	Boot Magic, LILO
Installation & Configuration Tool	Lizard, COAS	YaST	Linuxconf, RPM	Linuxconf, RPM
WWW Browser	Netscape 4.5.1	Netscape 4.5.1	Netscape 4.5.1	Netscape 4.6
WWW Server	Apache 1.3.4	Apache 1.3.4	Apache 1.3.6	Apache 1.3.6
Office Suite	WordPerfect 8-Download Edition, Star Office 5-Personal Edition	WordPerfect 8-Download Edition, Star Office 5-Personal Edition	Star Office 5-Personal Edition	Star Office 5.1-Personal Edition
Other Bundled Apps	BRU Backup (Personal Edition)	Many free and commercial demo apps.	IBM Via Voice, Many free and commercial demo apps.	None
Bundled Documentation	Getting Started Guide (210 pp.), Pocket Quick Tips	SuSE Linux Manual (440 pp.)	Installation Guide (410p), Getting Started Guide (288 pp.)	Deluxe Linux Getting Started Manual (25 pp.), Linux-Mandrake User Guide (142 pp.), Linux-Mandrake Installation (47 pp.), plus 3 digital books (2000+ pp.)
Installation Support	90 days e-mail	60 days (limited) phone, e-mail	30 days phone, 90 days e-mail	Unlimited e-mail
Price	$40	$50	$80	$50 / $30
VERDICT	9	7	■	8

Perplexing Partitions

Though it's technically possible to configure Linux to run from within a traditional Windows file system, Linux needs its own hard drive partition in order to really shine. However, most computers come configured with just a single partition on a single hard drive, leaving no room for anything but Windows. What's a Linux wannabe to do? Use a partition. But in lieu of wiping out your data using the ancient fdisk command, there are a few better options:

The Magic of Partitions

Are you sure you don't already have a partition that you can wipe clean and turn over to Linux? Pre-Windows 98 and FAT32 machines were often constructed with extra space allocated as a separate partition. If you've got an extra partition, use it—just be sure to copy any data that's on your D partition onto your C drive before installing Linux onto D. And don't install Linux onto C by mistake...

If your machine doesn't boast a free partition, you can use a commercial repartitioning tool to convert your extra hard drive space into a partition. Though it's wise to back everything up before creating partitions, repartitioning tools such as *PartitionMagic* are considered to be safe, easy-to-use, and reliable. Of course, they're also expensive—the full retail version of *PartitionMagic* lists for $70. Budget-minded consumers should check out Mandrake's freeware program *DiskDrake*, which is just now entering beta.

Extra Drives

Hard drives are dirt cheap right now. If you plan to get serious about Linux, it may be worth your while to buy a second drive dedicated to running Linux.

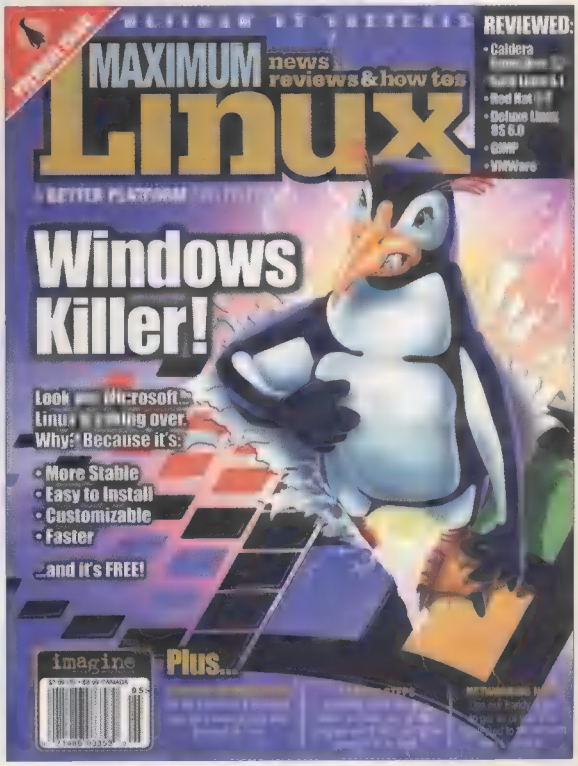
FIPS

As a last resort, try the free *FIPS* utility included with most Linux distributions. *FIPS* can sometimes split an existing partition in two without destroying data. *FIPS* is tricky, though, and it works only with certain setups. Read the documentation carefully, and be sure to make a backup before giving it a whirl.

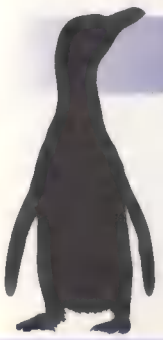
WE WANT TO KNOW WHAT YOU THINK OF MAXIMUM Linux news reviews & how tos

TELL US and WIN a Matrox G400 card or a Linux game!!

Welcome to *Maximum Linux*. Our editorial goal is to give you the best Linux information out there. So, help us out and tell us about yourself, tell us what you think about this special issue and tell us what you want in a Linux magazine. **In the process, you'll be entering to WIN a Matrox G400 card or one of many Linux games.** Please follow the directions below.



TO ACCESS OUR SURVEY GO TO:



http://www.survey.com/maxlinux.html

Once you're there the survey will only take a couple of minutes to fill out. *Maximum Linux* greatly appreciates your time and effort. We look forward to hearing from you!

X WINDOW 101

SOME GUI GUIDANCE FOR THE LINUX LOVER IN YOU

Regarded by many as "boring," "text only," and "cumbersome," Linux has had it tough in the home-enthusiast market. But the winds of change are blowing, and windows managers for Linux have come a long way, baby.

The X Window System is the most widely used window manager out there, since it's bundled with many commercial Linux distros. While it's no breeze to set up and configure, if you can harness its power, you'll find you've gained a very flexible tool. This simple introduction to the major components of X will familiarize you with what can be an impressive and functional GUI for your desktop.

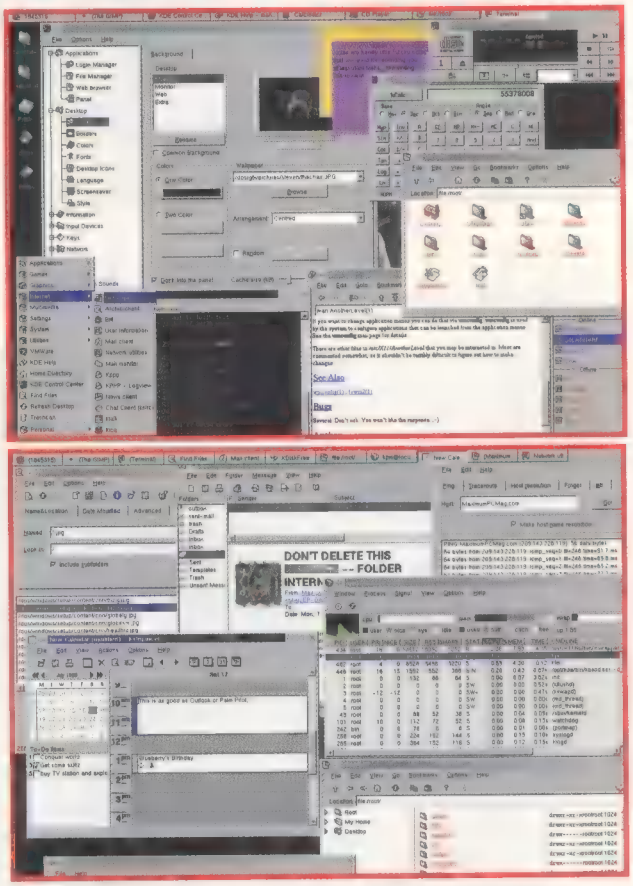
—Keith Beattie

Are you being served?

The X Window System uses the client-server model we all know and love from the web—just as the web has clients (a.k.a. browsers) and servers, so does X. Strictly speaking, in any such architecture, the server is in charge of managing a resource for one or more clients. The X server manages your screen (known in X parlance as a display) as a resource on which clients present their GUI. This leaves the X server to deal with, among other things, the specifics of your hardware and its low-level graphic drawing capabilities.

Home-brewing an X server is tricky. Linux, which uses the XFree86 X server, stores all the details about your videocard and monitor in a file called xf86config. While you can edit this file yourself, it's much easier to let a tool do it for you. XF86Setup and xf86config, which come with XFree86 itself, or Red Hat's Xconfigurator will walk you through a series of questions and then write your xf86config file.

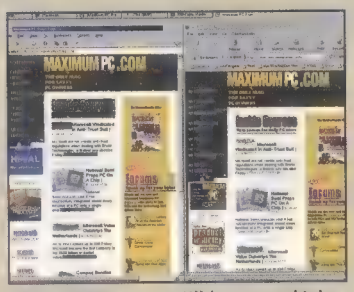
An X client, on the other hand, is simply an application



1) A wealth of applications and utilities come standard with KDE. Users won't notice anything missing that isn't in a stock install of Windows98. This polished and configurable window manager feels familiar and is consequently easy to navigate. 2) System administration is no longer delegated to boring text configuration files; while they're still there for maximum flexibility, clean GUI's are the modus operandi now.

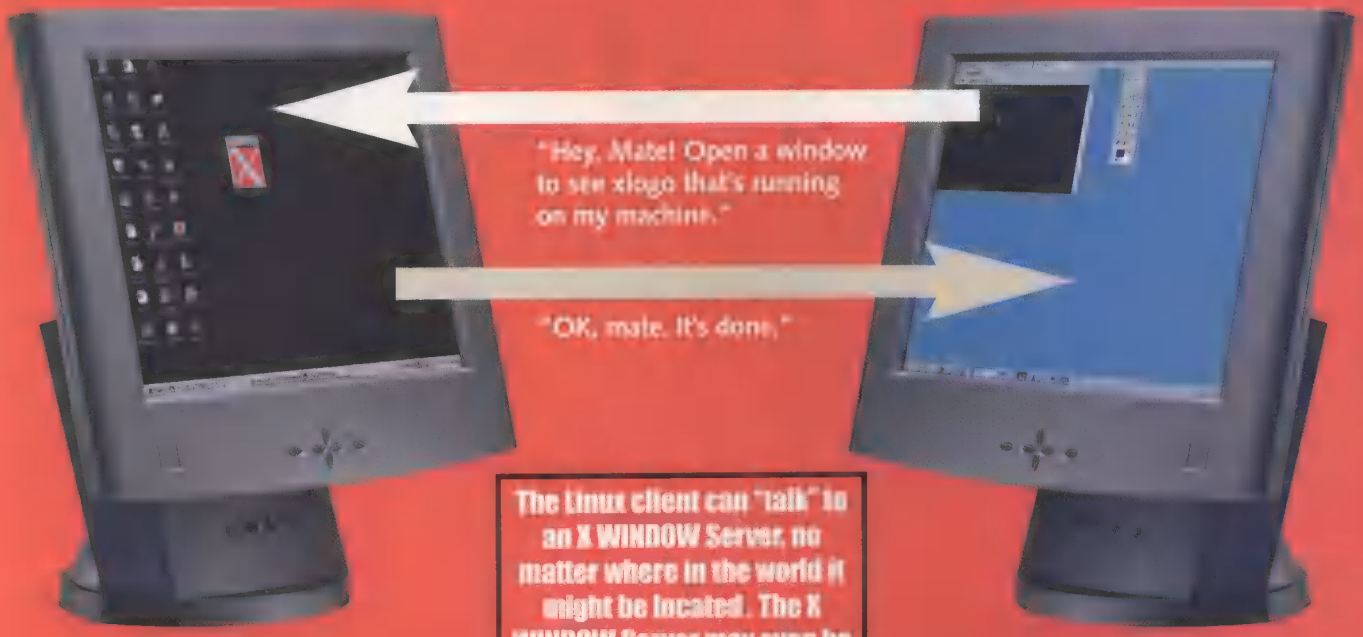
Desktop Environments: KDE and GNOME

Since X doesn't enforce a look and feel, each application can do its own thing. This can be a problem not only for users, but also for developers who want a unified look for a collection of applications and wan them to interact in specific ways—such as drag and drop. This gave rise to desktop environments, such as GNOME and KDE, which don't replace X or the window manager, but work alongside them to create an integrated, consistent, and easily configurable graphical interface. Both KDE and GNOME provide an integrated GUI experience that is easy to configure, and provide libraries for application developers to use when building programs and specifying how applications should interact with one another.



KDE's HTML parser still has some kinks to work out.

In our opinion, KDE is more robust than GNOME. It sports a polished and clean interface design, KDE Object Model (KOM), Drag & Drop, a control panel, and multiple desktops with floating icons. It also comes standard with a loaded suite of applications, games, and utilities. Novice and advanced users alike will appreciate how simple it is to navigate and work with KDE. Like the commonly tolerated legacy operating system, all the folders double as web browsers, icons are depicted with hyperlinked names underneath them, and URLs can be dragged and dropped onto the desktop—seamlessly integrating the Internet with the GUI.


"Hey, Mate! Open a window to see xlogo that's running on my machine."
"OK, mate. It's done."
The Linux client can "talk" to an X WINDOW Server, no matter where in the world it might be located. The X WINDOW Server may even be a Windows 95/98 machine. Programs will appear to be running locally, even though they're really being executed on the Linux box.
X Window Server Located in Bath, England
Linux Client Located in Brisbane, QLD

that presents itself on the display via an X server. An application such as Navigator connects to the server in order to be displayed on your screen. The client then sends messages such as "draw a line here" and "draw this text there" to the server. Each client gets its own window on the screen in which all those drawing requests are fulfilled, resulting in an interface defined by the client but drawn by the server.

But wait, there's more...

This separation of church and state (between the draw-er and the drawn) allows for some truly impressive feats. The first is that the client does not need to be running on the same machine as the server. In other words, you can run a program on a machine at work and have its display shown on another machine at home—or for that matter, across the world.

And since multiple clients can be displayed on a single server, you can have several programs, each running on different machines, all displayed on your "master control" screen in front of you. This can be invaluable if you work with or manage several machines. Even better, they don't need to be running the same OS—as long as the programs are X clients, they can connect to your display and will all appear to be running locally. However, X must be installed on all the machines in question in order for them to "see" one another.

The freedom of look and feel

The X server makes no assumptions about the "look and feel" of its clients, or of the screen in general. This is handled by the window manager, the program that decides where client windows are placed, dictates the overall appearance of your display, and draws each client's so-called "decorations" and GUI behavior. The title bar, borders, icons, moving and resizing of windows, and so forth are all the job of the window manager. This very important program is itself an X client (so if you're really twisted, you could run your window manager remotely), but only one copy can be running at any given time.

This is what makes X look so cool. It's also why one configuration can look just like NT while another can look like something out of a sci-fi novel.

Running X without a window manager gives you a boring screen with an "X" for the mouse cursor; any windows will look regularized. In short, the appearance of the inside of the client window is the business of the client and the appearance of the outside of the window and the rest of the screen is the business of the window manager.

Choose your Weapon

X is by far the most popular and customizable GUI—there are about 15 different interfaces to choose fromt. Some of the more popular interfaces include

- **Feeble Virtual Windows Manager**, dubbed FVWM95, which looks staggeringly similar to Windows 95.
- **WindowMaker**, formerly known as AfterStep, and not coincidentally a clone of the NeXT GUI.
- **Enlightenment**, which has quite a cyber/sci-fi feel to it.

How long do you wait for information?

www.macdaily.com

Your information resource for all things Macintosh.

MacAddict • Inside Mac Games
MacSurfer • Version Tracker
As the Apple Turns • Price Pulse
Mac Resource Page • No Beige
Mac Daily Network
Mac Observer • Every Mac
Deal-Mac • Mac Gamer's Ledge
Mac Fix It • Iconfactory
ResExcellence • The iMac

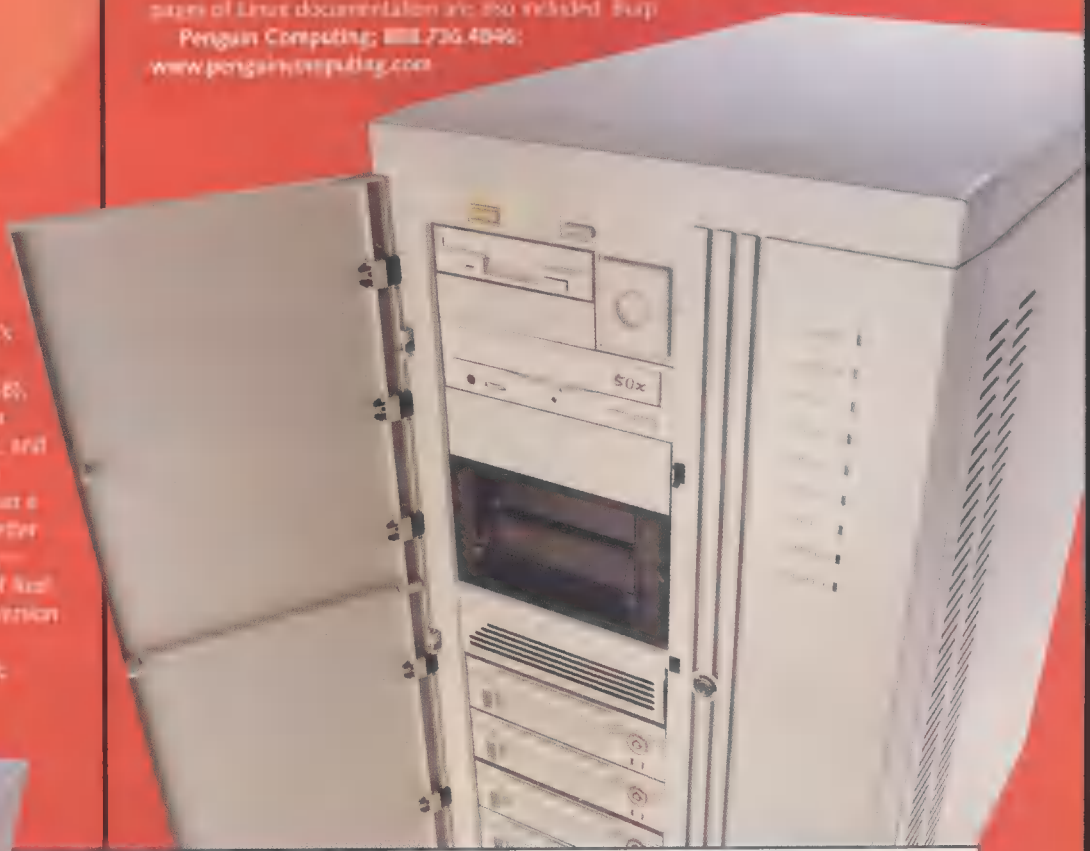
PURE LUST

HARDWARE TO MAKE YOU DROOL

PENGUIN 700

Behold the power of the penguin—Penguin Computing's $20,000 Penguin 700 uniprocessor PC. But is it worth it? Is it worth making this sweet system—like going to Baskin-Robbins and trying to decide on which of the 31 delectable flavors to get. In this case, your decision-making options number in the hundreds, which makes selecting even one component a tantalizing task. Still, our test system—which accompanied dual 550MHz Xeon processors in a full-size, floor-mounted case; 1GB ECC 100MHz SDRAM; six Quantum 18.2GB hard drives; an Ethernet adapter; a 50x CD-ROM drive; and an Optiquest 17-inch monitor—was mixed yummy to our tummy. Red Hat 6.0 and more than 1,600 pages of Linux documentation are also included. Burp.

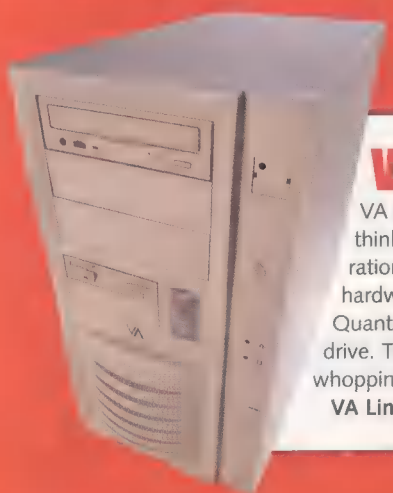
Penguin Computing; 888.736.4846; www.penguincomputing.com



AS-PRODPX

ASL Workstations is best known for its low-cost Linux systems, but don't let that lull you into believing they provide any less powerful performance. Thanks to the AS-ProDPX's dual 550MHz Pentium III's, 128MB 100MHz SDRAM (upgradable to 1GB), Matrox's newest Millennium G400, a 9GB hard drive, an Iomega Zip drive, and a 50x CD-ROM drive, all your Linux applications will be smokin' faster than a T-bone steak at a Texas barbecue. Better yet, the price for the whole shebang—including the pre-installed versions of Red Hat 6.0 and X Inside Accelerated X version 5.0—is only $4,060.

ASL Workstations; 877.275.3535; www.aslab.com



VaRStation 28

VA Linux Systems' VarStation 28 can be equipped with just about every PC technology you can think of. Our system was well suited for every Linux task we threw at it, but your personal configuration may vary depending on your needs and the balance of your Swiss bank account. Standard hardware includes a single Pentium III processor, one 16-72 module of 128MB 100MHz SDRAM, Quantum's Atlas IV 9GB SCSI hard drive, Matrox's Millennium G200 AGP card, and a 40x CD-ROM drive. The company will even throw in Linux *Office Suite 99* for free! Our tricked-out pony cost a whopping $12,400. Too bad we had to send it back. Sigh.

VA Linux System; 888.546.8948; www.valinux.com

ADD SOME DEPTH TO YOUR TEXT

Step 1: Duplicate your text layer in the Layers & Channels dialog box. Select only the bottom layer. Right-click on the image and select <Filters><Blur><Gaussian Blur RLE>. The default settings are fine.

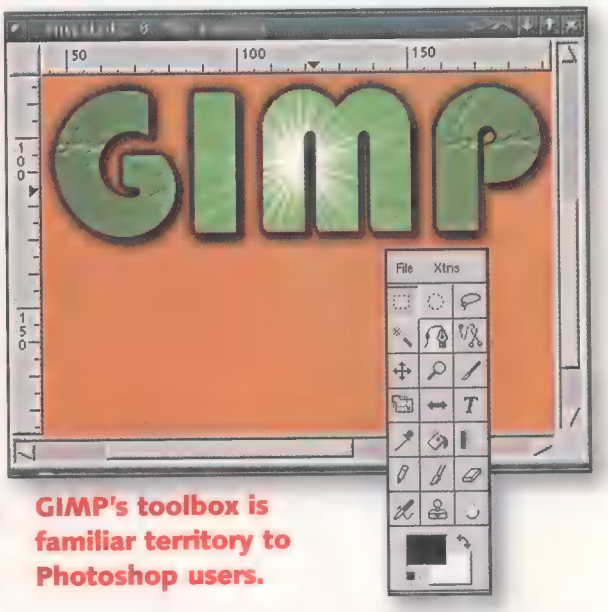
Step 2: Select the move tool from the toolbox and move your blurry text slightly downward and to the right. Next, select the top layer and double-click the gradient tool button. Select "Addition" for the Mode, and "Custom" for the blend. Go to the main GIMP Window and select <File><Dialogs><Gradient Editor>. Select "Horizon_1" from the gradients, or another one that you like.

Step 3: Go back to your image, ensuring the top layer is selected. Left-click from top right to bottom left, dragging the mouse across the text. Let go and your text will have a nice gradient. Right-click on the image and select <Script-Fu><Decor><Add Bevel>. Use the default settings. The text now has some rise to it, with a nice shadow behind. Create a white bottom layer in the Layers & Channels dialog and fill it will the "3 point tile" Pattern.

TrueType Fonts Under Linux: http://math.missouri.edu/~stephen/software/xfsft

GIMP 1.0.2

GRAPHICS DONE RIGHT



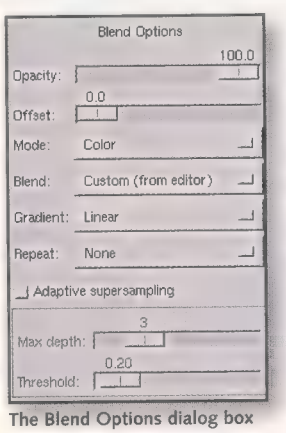
GIMP's toolbox is familiar territory to Photoshop users.

Many who haven't taken the Linux plunge are waiting for core developers to port their applications over. But while Windows users have been tinkering with *Photoshop*, a little-known alternative has been gaining popularity on Linux. It's called *GIMP*—the GNU Image Manipulation Program—and has nothing to do (as far as we know) with the Quentin Tarantino character of the same name.

GIMP was written by Peter Mattis and Spencer Kimball, and is released under the GNU Public License agreement. That makes it free to use, copy, modify, sell, or create additions to. But there's more to it than just price. We own *Photoshop*, but prefer *GIMP* because of the numerous user-developed plug-ins that come ready-to-use out of the box.

The first thing you'll notice about *GIMP* is that the toolbox is similar to *Photoshop*'s. The familiar selection tools, fill tool, gradient tool, brushes, eraser, and so forth, are available on both apps. *GIMP*, however, goes above and beyond *Photoshop*'s limited options. For example, double-clicking on each tool brings up advanced options, so you can select things such as transparency for the eraser, gradient options, pattern fill settings, and more. Also included are some 100 user-customizable gradients, 180 rich fill textures, three dozen brushes, an animated GIF previewer, and a scripting utility for generating everything from image maps, to flashing neon signs, to the dreaded "Spinning Globe" logo.

10-Second Logo: Click on <Xtns><Script-fu><Logos><Alien>.



The Blend Options dialog box lets you create and customize your gradients from scratch.

When it comes to flexibility, *GIMP* beats the pants off *Photoshop*.

Along with the built-in scripts and image tools, *GIMP* comes with multiple levels of undo/redo, something *Photoshop* didn't pull off until version 5. Also included are scripts that allow you to work on a copy of your art, leaving the original unchanged. *GIMP* comes stock with 28 output formats, including multilayer GIF for creating flaming corporate logos, and XPM for use in applications you develop yourself. *Photoshop* offers significantly fewer options.

One of the big drawbacks of *GIMP* is the X Window System's inherent lack of TrueType fonts. Not *GIMP*'s fault, but you have to recompile the X server or download a pre-compiled binary with the inherent security concerns of doing so. *Photoshop*, of course, works with any fonts that Windows recognizes, TrueType or otherwise. We've included information in the sidebar on getting TrueType fonts running under X.

Documentation is about the same for both apps. *GIMP* has an excellent free manual, which prints out to several hundred pages, but is worth every grain of toner. The manual includes several how-tos, as well as theory of computerized image processing. *Photoshop*'s advantage is that Adobe has numerous help files, online support, and a plethora of print books available at your local bookstore. Both apps have online FAQs and some how-tos available on their web sites and user sites.

One of the things that keeps people away from open-source software is the incorrect belief that if it's free, it must be worthless. Never once have we had a "blue screen of death" or had to reboot while running Linux and *GIMP*. Running *Photoshop*, however, we've had several instances where the program blew chunks. While this might not be *Photoshop*'s fault, if your cruise ship sinks, does it really matter how good the buffet was?

—Jared Armstrong

THE SPECS

REQUIREMENTS
X Window System

RECOMMENDED
Pentium 100MHz, 16MB RAM, 4MB+ graphics card

PLUSES

- Robust tools
- Multiple [illegible]
- Free
- [illegible]
- [illegible] documentation

MINUSES

- [illegible]
- [illegible]

MAXIMUM LINUX VERDICT

Price Free
Company GNU GIMP Project, Peter Mattis and Spencer Kimball
URL www.gimp.org

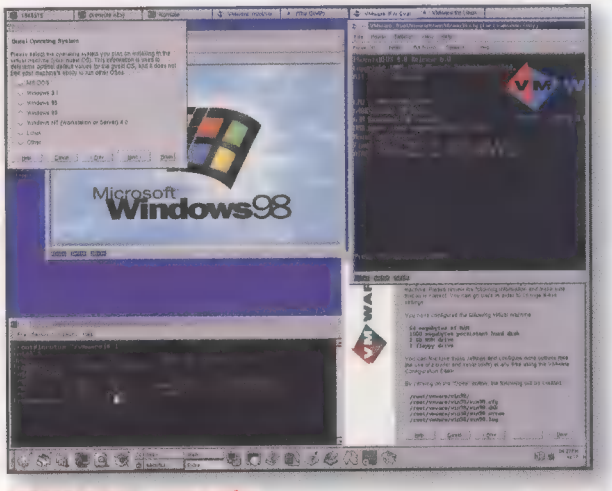
9

VMWare v1.0

THE VIRTUAL DREAM MACHINE

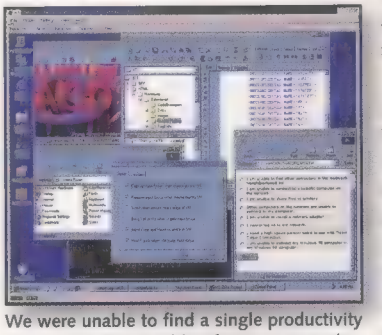
A few short years ago, the only home computer on which we were able to concurrently run multiple operating systems in separate windows was in our dreams. But *VMWare* is making the fantasy a reality, allowing anyone with an x86-based Linux box to run multiple OSes without rebooting to shift between them.

VMWare installation is astonishingly simple, and unlike most dreams we have, it actually makes sense: A wizard walks you through the process, guiding you to choose the guest operating system you'll be working with and helping you to configure multiple OSes. Answer a few questions about peripherals, allocation of drive space and memory, and the location in which you'd like to store the guest OS's system file, and you're good to go—*VMWare* powers on and the familiar memory ticker, HD statistics, and PhoenixBIOS 4.00 R6 are initiated, complete with the customary "Press <F2> to enter Setup" prompt. Welcome to your freshy-fresh virtual x86 machine, on which you should feel as free to install additional OSes as you are doing the horizontal hucklebuckle with Gillian Anderson in your nighttime fantasies (you thought we didn't know, didn't you...). Choose any flavor of Microsoft Windows, Linux, or FreeBSD. BeOS and OS/2 aren't currently supported.



VMWare's wizards make the creation of virtual machines dreamily easy.

Plug-n-play devices are readily detected during *VMWare*'s bootup, as are other virtual peripherals such as Ethernet and SoundBlaster cards. Once the setup is completed, install programs as usual—and don't forget to pause with amazement the first time you run Microsoft *Word*. Or take a real trip to Dreamland by installing the suggested X-server upgrade and Windows accelerator program that's supplied on *VMWare*'s web site. Switch to full-screen mode and you'll swear it's native performance—you can even cut and paste between the multiple OSes. Plus, there's a lulling sense of security in knowing that when Win98 does crash, it won't take the whole system down with it—only that window will go, Linux and the other guest OSes will be unaffected. Better yet, the overhead that *VMWare* puts on the host OS is so small, you probably won't even notice.



We were unable to find a single productivity application that wouldn't function properly under VMWare, as long as it didn't directly touch hardware or DirectX.

Unfortunately, *VMWare* provides minimal support for DirectX/DirectDraw, so playing games on your guest OS is out of the question for now. And until support for USB devices is added to Linux, you won't be able use them on the other OSes, either. SoundBlaster digital audio is emulated, but MIDI is not.

Though there's currently no hard limit on the number of operating systems you can run simultaneously, there are practical limits on the amount of physical memory, file system space, and processor capacity available for each particular system configuration. Should you be lucky enough to possess a symmetric multiprocessing (SMP) system, then the host operating system can assign a single processor to each virtual machine. However, no SMP support is available for the guest OS. Networking requires DHCP or an additional IP address that's separate from the hosts.

Unless you're a hardcore gamer, *VMWare* will allow you to accomplish any of your daily work or home-related tasks using the programs you're already familiar with. Until more programs are ported natively, this is the closest you'll get to seeing your multi-OS dream come true.

— Daevid Vincent

MAXIMUM LINUX VERDICT

Developer VMWare, Inc.
Price $100 for single-user noncommercial
URL www.VMWare.com

9

ALTERNATIVE DREAMSCAPES

What makes this ambitious effort so challenging is that the x86 processor is not naturally "virtualizable," and was not inherently designed to run multiple operating systems concurrently. Multiple operating systems cannot directly access the same set of hardware devices, creating another roadblock—some hardware emulation must occur transparently to all guest operating systems and be brokered by the host OS.

VMWare isn't the only playa' in this game. Whenever a commercial company has a clever idea, the OpenSource movement jumps in and attempts to do it better and for free. Take a gander at the *FreeMWare* project (www.freemware.org) that just started coding. For the x86 side of the CPU, check out *WINE* (www.winehq.com) and *DOSEmu* (www.dosemu.org). If the Motorola chip is more your speed, Ardi's *Executor* (www.ardi.com) is a fabulous Macintosh emulator. And finally, the infant-staged *Freedows98* project (www.freedows.net) tries to mirror *VMWare*'s achievement, but only at the kernel level.

THE SPECS

REQUIREMENTS

Pentium II 266MHz or equivalent (SMP is supported)
64MB RAM and 6MB HD, plus enough RAM and HD space for each host OS
XFree86-3.3.3.1 or higher release

PLUSES

Each OS runs in its own protected space
Full-screen mode for improved performance
No dual booting or boot manager needed

MINUSES

Minimal DirectX support
Windows mode not as full-featured
Unoptimized parallel port access, slow
Video is slow, no hardware acceleration

For definitions of Terminator words, hyperlink to the back of Maximum Linux.

MAXIMUM LRC

Linux Resource Central

Welcome to the LRC, our comprehensive list of web links for all things related to the wonderful world of Linux. We've tried to include as many sites as possible, but due to space constraints, we had to limit our selection to what we consider some of the best.

The Linux HOWTO Index

The HOWTO index includes more than 100 detailed documents covering a wide variety of Linux-related topics. Everything you could possibly imagine is included, ranging from graphic-card-specific questions to getting Linux running on a Palm PDA.

www.metalab.unc.edu/mdw/HOWTO

The GNU Project Free Software Foundation

www.gnu.org/philosophy/free-sw.html

Kernel Sources

Want to download the kernel? Here are a few good places to visit:

www.kernel.org
www.sunsite.unc.edu/linux

The Linux Documentation Project

The LDP's overall goal is collaboration with regard to Linux documentation issues, including online documentation and printed manuals covering topics such as installing, using, and running Linux. Check it out at:

http://metalab.unc.edu/LDP/

X Marks The Spot

The web is replete with resources on X, Window Manager, KDE, and GNOME. Here are a few good ones:

www.x11.org
www.xfree86.org
www.gnome.org
www.kde.org
www.plig.org/xwinman
www.enlightenment.org
www.windowmaker.org
ftp://mitac11.uia.ac.be/html-test/fvwm95.html
http://fvwm.math.uh.edu/

Window Managers for X

www.plig.org/xwinman

KDE Themes

www.themes.org

The Daily Planet

Looking for the most recent Linux news? Take a gander at:

www.linux.org
www.linux.com
www.freshmeat.net
www.slashdot.org
www.linuxcare.com

Linux Post Office

For e-mail filtering, *procmail* is unrivaled. Not only does it do the standard sorting and deleting of incoming messages, but it can also be instructed to run external scripts. One invaluable "recipe" (as they're called) automatically sends e-mail from a list of specified addresses to an alpha-numeric pager. Want to control the appliances or lights in your house via e-mail commands sent to X-10 modules? Try it out at:

www.procmail.org

The Lion King's Other Brother

To transfer files across an Intranet, check out *samba*. It's a bit tricky to set up, but is much more flexible and transparent to use than ftp. In a nutshell, it allows Microsoft, Macintosh, and Unix-based file systems to coexist peacefully in a heterogeneous environment. Directories can be shared out on Linux so that Win98 can mount them as it would any other Microsoft shared directory—complete with user and password mapping. Visit:

www.samba.org

Helpful Reminder

Remind can be a life-saver, doing just what it sounds like it would do: reminding you of important dates. Never again will you grovel for forgiveness because you missed your significant other's birthday or anniversary, or forgot to pay a bill. Download it at:

ftp.doe.carleton.ca/pub/remind-3.0

Other Utilities

www.courtesan.com/sudo
www.webnix.com/CLE/cdrom/powertools/safedelete.html
www.apache.org
www.x10.org
www.replay.com

Linux Vendors

Red Hat
www.redhat.com
Caldera
www.calderasystems.com
TurboLinux
www.turbolinux.com
Slackware
www.slackware.com
Debian
www.debian.com
SuSE
www.suse.com
Corel Linux
www.corel.com

Game Companies

Loki Entertainment
www.lokigames.com
id Software
www.idsoftware.com

Red Hat-Specific Device Configuration Tips

www.RedHat.com/corp/support/docs/Network-Config-Tips/Network-Config-Tips.html

Red Hat-Specific PPP Setup Tips

www.RedHat.com/corp/support/docs/PPP-Client-Tips/PPP-Client-Tips.html

diald Setup Tips

http://www.redhat.com/mirrors/LDP/HOWTO/mini/Diald.html

TERMINATOR

Tech Terms Revealed ▶

[illegible] terms used throughout MAXIMUM Linux are [illegible] and in the explanations.

A

Alpha A family of RISC–based CPUs and computer systems from Compaq. Originally designed by Digital Research.

ASCII Code Short for American Standard Code for Information Interchange. A basic text interchange format for all systems in the U.S.

B

Big endian and little endian Describes the sequence in which a processor stores bytes of data. In big-endian architectures, the most significant bytes are stored in the lowest memory address. In little-endian-based architectures, the least significant bytes are stored in the lowest memory address. Most UNIXes and the Internet are big endian-based. Intel processors are little endian-based.

Bit Mask A pattern of binary values. See "net mask."

C

chat A program typically used to chat with modems in setting up phone lines for PPP connections. chat is part of the pppd package. It is based on a simple "send this / expect that" language called a chat script.

CPU Central Processing Unit. The "brain" of the computer. Its processing speed is usually measured in Megahertz (MHz).

Curses-Based Console GUI A simple, low resolution graphical user interface based on the curses programming library, suitable for running on a serial terminal.

D

Daemon Pronounced demon or damon (as in Matt Damon). A process that runs in the background and performs a specified operation at predefined times or in response to certain events. Typical daemon processes include e-mail handlers and print queues. The term comes from Greek mythology, which describes daemons as guardian spirits.

diald A slick little program that picks up the phone and dials your ISP when one of your machines asks for a packet from the Internet. After some time of no traffic, diald will also hang up your ppp connection. Using diald gets around the problem of having to manually launch a dialup script (such as ppp-on) every time you want to connect to the Internet.

DNS Short for Domain Name System. The Domain Name System provides mappings between domain names and IP addresses. A domain name server converts names to addresses and addresses to names.

DOS Short for Disk Operating System, bought by Microsoft and licensed to IBM in the early 80s. This was the operating system of choice for many years, and many flavors of DOS were once available. Today, it serves only as a platform for Windows, and is nearly unheard of as a main OS.

E

Ethernet A networking hardware standard. Ethernet is by far the most common network hardware. It usually consists of cables, network cards, and possibly a hub or switch.

F

Firewall A firewall is a break point between networks where all traffic is examined and accepted or denied based on a set of rules. Firewalls are used to grant some measure of security in a network. By placing a firewall between a home network and the Internet, you block connections originating from the Internet to your home machines, while still allowing all of your machines use the Internet.

FTP File Transfer Point. A typical protocol used on the Internet for downloadable files.

G

GNU A complete free software system that is upwardly compatible with Unix. GNU stands for "GNU's Not Unix."

GUI Short for graphical user interface. Pronounced "gooey."

H

Header files In the C language, header files define basic functions such as printing to the screen and writing data to disk. They save programmers work by allowing them to use the headers rather than writing each function by hand.

Hell's Angels An infamous motorcycle gang that originated in California.

I

Inbound Connections Network connections originating from outside a network destined for an address inside a network.

IP Address Short for Internet Protocol Address. A unique address assigned to each computer on a TCP/IP network (such as 205.160.0.81).

IP Routing Short for Internet Protocol Routing. The process of receiving an IP packet addressed to somewhere else on one network and sending it on its way via another network.

ipxtunnel A program that encapsulates IPX (old Novell packets) inside TCP/IP. You can use ipxtunnel to link IPX networks together over the Internet.

ISP Short for Internet Service Provider. A facility that sells Internet services to consumers or businesses.

K

KDE A powerful graphical desktop environment for Unix workstations. KDE is an Internet project and truly open in every sense. Development takes place on the Internet. No single group, company, or organization controls the KDE sources. All KDE sources are open to everyone and may be distributed and modified by anyone subject to the well-known GNU licenses.

Kernel The bare-bones component of any operating system.

L

LILO LInux LOader. Program used to boot Linux, and used

as a boot manager as well.

Loopback device A theoretical Ethernet interface. When a computer wants to talk to itself through a network port, it uses its loopback device. Network connections through the loopback device are treated as any other network connection.

M

Macintosh A family of computers developed by Apple, first introduced in 1984. These computers were the first to popularize the Graphical User Interface, although today they hold a small piece in the market. Also, a tasty fruit treat.

Milibleams The fraction of time between the point someone says "free food" and the response "where?"

Module A module includes software that can be loaded and unloaded as needed while your operating system is running. The module is loaded when the kernel is asked to perform a task that requires that module. Kernels that are compiled to use modules are known as modular kernels. Kernels that are compiled with all software built in are known as monolithic kernels.

N

Netmask A 32-bit bit mask which shows how an Internet address is to be divided into network, subnet, and host parts. See "bit mask."

P

PAP Short for Password Authentication Protocol. With a PAP login, a PPP session is started before the username/password is transmitted. PAP is a password authentication scheme supported by PPP. Conversely a clear-text login would deal with passwords (in clear-text) before the PPP is started.

PDA Short for Personal Digital Assistant. A handheld computer that serves as an organizer for personal data.

Ping A program used to send an echo packet over a network. The ping program is typically used to determine if there is connectivity between two machines on a network.

Ported To take an application written for one specific platform, such as Windows, and rewrite portions of the code so it can work on another platform, such as Linux.

Posix Short for Portable Operating System Interface for Unix, a set of standards that define the language interface between application programs and the Unix operating system. By designing their programs to conform to Posix, developers have some assurance that their software can easily be ported to Posix-compliant operating systems. This includes most varieties of Unix, as well as Linux and Windows NT.

PPP Short for Point to Point Protocol. A popular protocol used to transmit data packets between two points.

pppd Short for Point to Point Protocol Daemon. By far, the most popular Unix implementation of PPP. This program deals with connecting the PPP protocol directly and has many slick little features, such as the ability to run scripts upon initiation or completion of a PPP session. Not only can pppd run as a client, but it can also run as a server so in theory you could be your own ISP!

R

RISC Short for Reduced Instruction Set Computer. A chip architecture that reduces chip complexity by using simpler instructions. In short, RISC helps make the CPU faster. Note: Intel processors aren't RISC. They use an instruction set called CISC (Complex Instruction Set Computer), which inevitably slows them down. Operating systems must be written differently to run on these different architectures.

S

Shell Another term for user interface. Operating systems and applications occasionaly provide an alternative shell to make user interaction with programs easier. A "command shell" is the command processor interface, the program that executes operating system commands.

SMP Short for Symmetric Multiprocessing, a computer that's equipped with more than one CPU. SMP provides faster performance by making multiple CPUs available to complete individual tasks simultaneously.

Sparc Short for Scalable Performance ARChitecture, a family of 32-bit RISC based CPUs developed by Sun Microsystems.

SSH Short for Secure Shell, a program developed by SSH Communications Security that lets you log into another computer over a network, to execute commands in a remote machine, and to move files from one machine to another. SSH includes strong authentication and secure communications over insecure channels.

Subnet Boundary IP addresses can be grouped into subnets of some size, usually evenly divisible by 8. A subnet boundary is a limit between two subnets. You could figure out where your subnet boundary lies by looking at your netmask and network numbers.

T

tag RAM Memory chips that store memory addresses for use by a microprocessor's Level 2 (L2) or Level 3 (L3) cache. The memory addresses point to locations in main memory (RAM) from which the data in the cache came. Without enough tag RAM, the cache can "see" only a limited amount of the system's total memory.

Terminator A synthetic flesh-covered cyborg designed to kill specific, preprogrammed prey.

Texture The surface graphics on a 3D object. Without textures, 3D objects look like naked skeletons of polygons. Textures add realism—a brick wall, the skin of a lizard, or the gleaming metal surface of a spaceship. A 3D program stores a texture as a graphic pattern and applies it to the structure of polygons.

370-pin socket An unofficial term for a 370-pin CPU interface introduced by Intel in 1998. It's sometimes called Socket 9, because Socket 8 was the Pentium Pro's interface and Socket 7 was for Pentium-class CPUs.

U

Unix An operating system developed by AT&T Labs in 1969. Used mostly by government and academic agencies, Unix is one of the first, true network operating systems.

W

Windows Microsoft's Graphical User Interface. By far the world's most popular OS because of its intuitive interface. However, Windows is not truly an operating system in itself, as it still requires the DOS kernel to run and process commands (with the exception of Windows NT, in which Microsoft did away with DOS completely.)

WINE Literally stands for "Wine Is Not an Emulator," a program used to run some Win32 apps under X Window System.

X

X Window System A graphical user interface for Unix and Unix-like systems.

MAXIMUM BIOS

TO THE SOURCE

Mae Ling Mak

Mae Ling Mak currently lives in San Francisco, and is sporadically a student of computer science and biology. Since her introduction to Linux, she has become an advocate for the OS, participating in local Linux events and spending countless hours volunteering to further the cause. You can reach her at **spinster@moebius.digitalflock.org**.

Mike Luton

Michael "Sandmoose" Luton learned his early Unix skills from an old bald guy on a WYSE terminal. He currently writes a monthly column for *PC Gamer* called "The Killing Box." He spends his free time studying the arcane meowing language of his big, furry, and very vocal cat. You can reach him at **mluton@imaginemedia.com**.

Jared Armstrong

Jared Armstrong is the System Administrator for the Westin Alyeska Prince Hotel and Resort in Girdwood, Alaska. When he's not writing software for Linux and participating in the Alaska Linux Users Group, he enjoys fishing, canoeing, target shooting, and snowboarding. You can reach him at **jared@greatland.net**.

Chris Dunphy

Chris Dunphy was the original technical editor of *boot* Magazine (now known as *MaximumPC*), and wrote *boot*'s first Linux feature way back in '97. He now serves as Rendition's Developer Relations Manager and Chief Evangelist. He still is, and always will be, an alternate-OS nut. Chris can be reached at **cmd@thematrix.com**.

Rob Hall

The Technical Administrator at Professional Computing Services in Rogersville, TN, Rob is a tried-and-true open source Jedi, working with Linux machines on a daily basis. Rob would like to throw out a hearty "What's up?" to all his buds in channel #Linux on NewNet's IRC network. You can reach him at **rwh@charter.net**.

Daevid Vincent

Daevid Vincent is the former webmaster for *boot* and *MaximumPC*. He currently resides in the Redmond, WA area and plots to overthrow the Empire through the evangelism of Linux. He awaits the day wet-wear is ubiquitous and cybernetics are installed at the local Target store. You can reach him at **daywalker@thematrix.com**.

Keith Beattie

Having annoyed just about anyone who brings up anything even remotely close to the subject, Keith has been preaching the merits of the free software movement since he first typed 'C-h t' in an Emacs buffer back in 1989. You can reach him at **MaxLinux@icds.org**.

Anders Brownworth

Anders maintains the Linux Netatalk-HOWTO (Macintosh file server for Unix) and is currently working on a Linux-based car MP3 player. He also works for Imagine Media as a webmaster and systems administrator. His pro-bono work includes establishing an e-mail system for a hospital in Haiti. You can reach him at **anders@imaginemedia.com**.

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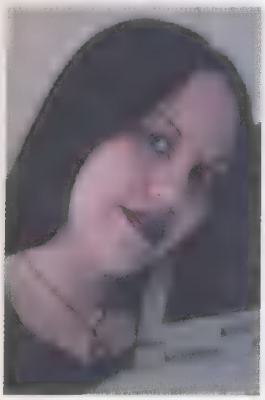
How I Became A Linux Convert

Her name is Lal. She's named after an android from "Star Trek." She is my companion, my confidante, and at times my lifeline to the friends and family I left behind when I moved to California from Mississippi. She's such an integral part of my life that I have her barcode and serial number tattooed on my wrist.



Mae Ling Mak is a Linux convert who vows never to go back. She now spends her waking moments furthering the cause.

OK, so I'm a bit attached to my computer.

Lal's happiness has always been important to me. I like to give her gifts: freeware, shareware, and other little downloaded treats. But some of these presents turned out to be a little buggy. I couldn't figure out what was causing these episodes; maybe Lal and the programs just didn't like one another?

I tried not to blame Lal—she was trying her hardest to do what I asked. But running the few and meager apps I needed on a daily basis would bring her to her knees. Her workload wasn't so heavy that she couldn't handle it: a mail client, web browser, graphics editor, HTML editor, and word processor. But if she couldn't run these typical programs, how could I expect her to run the heavy-duty voice-recognition app I'd found that would help me learn 31 foreign languages?

I'd done everything by the book—reformatted when necessary, kept her safe from spilling sodas, installed Windows as her OS...

Windows. I thought it was a necessary evil. I hated icons. I hated the mouse. I lived in constant fear of the next crash. But Windows was the way. It would take me and Lal Where We Wanted to Go Today. Or so I was told. But after every crash, I inevitably lost something. Research, homework, address lists—they all vanished, never to be recovered, and my rage would grow. Or worse, my father and I, accustomed to e-mailing each other a dozen times a day, were cut off while I spent hours rebuilding everything. I was worse than angry: I was lonely.

A full college schedule's worth of homework was set aside each night as I struggled to figure out why Lal was crashing. I felt as though I was caring for a sick family member, and spent every waking moment attending to my computer. My academic and social lives were quickly slipping into the abyss, but there was no way I was going to let technology get the better of me. It was war, even if I was the only one who knew it.

After eight weeks, I cracked under the stress. I'd spent all night every night for months trying to get Lal, the programs I needed, and Windows to play nicely together. I'd missed so many classes that I'd dropped out of trigonometry. All my efforts led me to one conclusion.

Windows had to go.

In February 1998, I gave Lal the best gift ever: Linux. Seeking help from friends, Linux user groups, and the Linux Documentation Project, I tried a dual boot to "test the waters." This is when I learned that Windows is engineered to assume that it will be the only OS on the hard drive. Who knew that OS was so darn cocky?

Linux, on the other hand, was extremely friendly. It took a couple of hours to get LILO up and running, but once the process began, it was amazing. Every question was Yes/No. When I was unsure how to answer a question, I went with the default. It turned out wonderfully. Linux shared hardware and played nice with all my programs. And the Linux community was open and helpful.

I was a Linux convert.

Things since then have been looking up—including my grades, the amount of sleep I was getting, and the number of hours Lal ran without needing a reboot. If a program locks up, I just kill it. In fact, the only downtime I've experienced since switching to Linux was between distributions (I've played with Red Hat, SuSE, Turbo, and Debian). Best of all, my e-mail connection with my father is still unbroken.

After weeping for mercy at the feet of Windows, after years of locked-up programs, neverending hourglasses, and innumerable "blue screens of death," I was free. I was finally Master—er, Mistress—of my computer. Plus, I had the satisfaction of knowing that I was in no way contributing to what I believe is Microsoft's plan to enslave the world with bad code. But that's another story altogether....

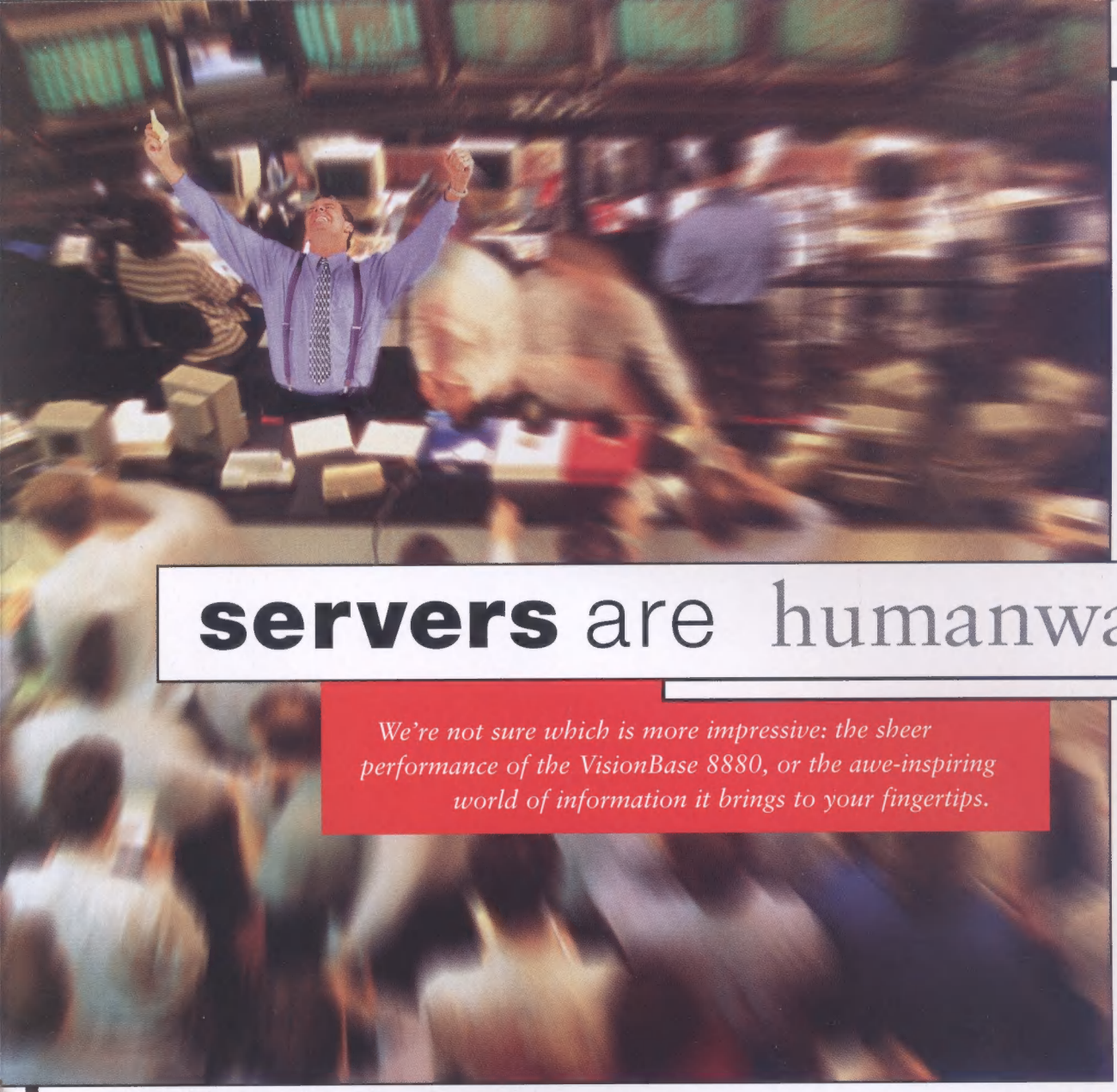
"I came to the only conclusion: Windows had to go."

Now, I have ambitions for Lal. I plan to use *Wine* or *Wabi* to run Windows-based apps, like the language tutor I couldn't have possibly run before. Voice recognition and home automation are next. I can do web authoring and graphics manipulation with no problem, so building web sites is faster and easier. Now, the time I spend working on Lal is to optimize, not revive, her.

Sometimes I get nervous about the Linux learning curve I'm on, but it's exciting work. I love Linux's inner-workings and shell structure. My main goal is to figure out what makes Linux tick.

I haven't seen an hourglass in quite some time—except on someone else's machine. Linux can take whatever I throw in its direction. And Lal? She is processing this very data as fast as I can send it to her. We've thrown ourselves into Linux without a shred of regret. I only wish I had done it sooner.

So does my Trigonometry professor.



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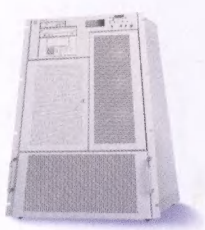

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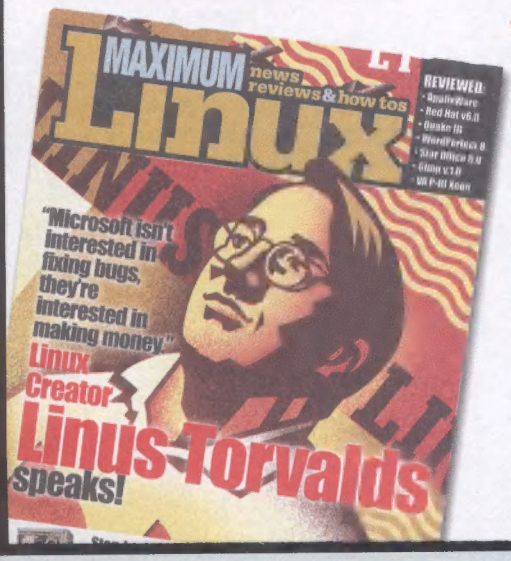

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